ELECTRICAL REVIEW

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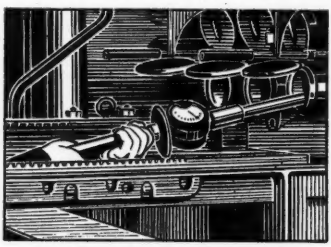

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER

ESTABLISHED 1872

Vol. CXLIII. No. 3707
10th DECEMBER, 1948

Professional Institutions

CONTRIBUTIONS AND BENEFITS

FROM time to time the old question is raised as to the value of membership of one or other of the leading engineering associations, as our Correspondence section has shown. Many of the writers take the hard-headed point of view which is concerned with a material and immediate return from expenditure on annual subscriptions.

An indication of the value of an association can be obtained from attendance at meetings and from perusal of the reports of the association in question, supplemented by inquiries of the committee or the secretariat. Growth of membership also provides evidence of the value attributed to connection with such a body by numbers of men who may be credited with having quite definite views about their own professional welfare. The Institution of Electrical Engineers, for example, has doubled its membership during the past fifteen years.

Membership and Ability

To some the attraction of membership of an institution is the ready evidence it provides of the possession of basic qualifications. It does not, of course, any more than does academic distinction, serve as a guarantee of fitness for a post. That must depend upon ability as an engineer to do a job which calls for other qualities in addition. However, there is justification for regarding membership of an appropriate body as a desirable aid in professional advancement, if only for the opportunities of making contact with other aspects of electrical engineering.

Although such considerations as the above naturally carry weight with those having a laudable ambition to secure positions in which their knowledge and skill may be most effectively employed, they are not the whole or even the better part of what institution membership can mean. When asked to support an application for entry, a sponsor usually entertains the hope that the candidate will prove an asset to his organization. This implies that the proper attitude of the individual is to ask himself not what he can get out of an institution (which is no more than the embodied resultant of the wishes of himself and others with similar interests) but rather what he can do to add to the common stock.

Voluntary Workers

Taking a long view, the rank and file member has only to consider how poor would be his prospects in a profession that was deprived of its voluntary workers. Capable and helpful as the permanent officials may be, it is the wealth of technical experience and ability to be found on the Council and committees of such an organization as the I.E.E. that in the eyes of the community makes it the fitting representative of electrical engineering. In this vast amount of work, whether disclosed in the form of reports or in the bare statement that upwards of 700 Council and committee meetings were held last year, the ordinary member has at his disposal the help and advice of men whose time has normally a high monetary value and whose reputations

are too well established to be added to in this way. Among them are the committee men in Local Centres and Sub-Centres, including the honorary secretaries, some of whom have held office for more than a score of years. If those who now doubt whether they get enough out of the Institution will try looking at things in this way, many of them will, we have no doubt, find themselves equally well rewarded by finding an outlet for their healthy social instincts and by earning the esteem of their fellow engineers.

FIRST CONSULTATIVE COUNCIL

To the South Eastern Area belongs the distinction of having the first of the fourteen Consultative Councils to be set up under the 1947 Electricity Act. The names of the fourteen chairmen were announced about two months ago; the chairman of the South Eastern Council is Councillor M. A. Bullock, A.C.G.I., A.M.I.E.E. The deputy chairman is also an electrical engineer, Brigadier F. T. Chapman, C.B.E., D.Sc., M.I.E.E., a well-known authority on electrical education. Another member is Councillor B. J. Watson, A.M.I.E.E., of Maidstone. This strong electrical element among the twenty-three members, reinforced by former chairmen of municipal electricity committees, will ensure that recommendations to the Area Board are reasonable and practicable.

THE GYRATOR

In addition to the capacitor, the resistor, the inductor and the ideal transformer, a fifth network element is conceivable. It has been named the gyrator because it "gyrates" a current into a voltage and vice versa, being defined as linear, constant and passive by a well-known research laboratory in Holland which believes that the introduction of the new element will much simplify network synthesis. Two ideal gyrators in cascade constitute an ideal transformer, while an ideal gyrator and an ideal transformer constitute another ideal gyrator. Since the extension of the element system from four to five is a relatively large one, considerably improved solutions are expected to be obtainable for most network problems. For example, if two equal critically tuned circuits (such as are commonly used in the intermediate-frequency stages of superheterodyne radio receivers) be coupled in an appropriate way by a gyrator and a resistance, then the amplification per stage can be made larger than that obtainable with inductively or capacity coupled circuits under similar conditions. The publication of further details of the employment of the new element will be awaited with interest.

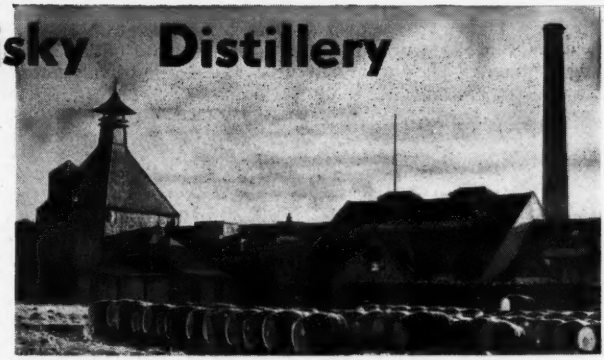
THE REHEAT CYCLE

From particulars given in *Power* (October) of 233 generating units with an aggregate capacity of 8.5 million kW, which represents nearly 60 per cent of public power station extensions in the United States from 1947 to 1951 inclusive, it appears that twelve employ steam reheating up to approximately the initial temperature. Steam conditions of these units range from 1,290 to 2,080 lb per sq in. and 825 to 1,050 deg F. In most cases the reheat cycle is said to have been adopted for its better heat rate rather than for the control of moisture at the turbine exhaust. The latter was apparently the main consideration for the 1,900 lb per sq in. units at Brimsdown, an account of which was given in our issue of 5th November.

ENGINEERS AND ADMINISTRATORS

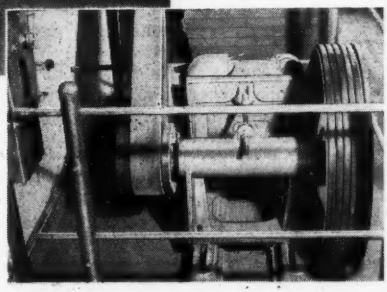
Judging from the reports, comments and correspondence in the *Electrical Power Engineer*, there is considerable disquiet among the members of the Electrical Power Engineers' Association at the disparity between the salaries they get and those received by clerical and administrative officers in the electricity supply organization. While it is extremely difficult to assess the comparative values of the service performed by each of these classes, there is a case for the closest investigation if there is not to be dissatisfaction and discouragement. It is pertinent to suggest, as the *Electrical Power Engineer* does, that if the B.E.A. is to obtain four or five hundred recruits in each of the next five years those recruits must be assured of well-paid appointments and good opportunities for promotion. It is also pertinent to point out, however, that many of the highest administrative posts in the new service are filled by engineers.

Whisky Distillery



COMPREHENSIVE MATERIAL-HANDLING INSTALLATION

BY the courtesy of the Longmorn-Glenlivet Distilleries, Ltd., we were recently able to see at their distillery at Longmorn, Morayshire, the electrical applications in whisky production, including some interesting modern group and individual drives. Barley, the primary raw material, is received at the grain loft by rail in bags from which it is tipped into an underground hopper which serves the boot of a bucket elevator. This equipment conveys the barley to a dressing machine, on the first floor of the grain loft, in which all foreign matter is separated from the clean barley. The barley is passed over riddles in the separator, while a fan blows away the weed-seeds and dust.

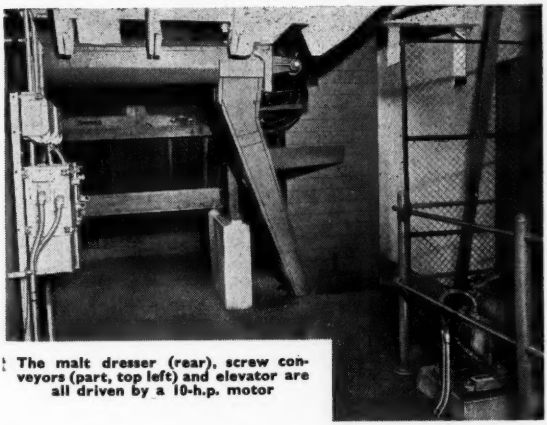


Three bucket elevators serving the dressing machine, loft conveyor and kiln, all driven as a group, and (right) self-contained motor and transmission unit, equivalent to a geared motor

The clean grain passes into the boot of another elevator which delivers it on to an overhead conveyor belt running centrally throughout the 50yd length of the loft. By means of a travelling "cage" engaged with this conveyor belt the grain can be distributed to any part of the loft floor. The barley is passed along the loft into a water trough below floor level at one end of the floor, and steeped. One "piece" of grain (about 30 quarters) is steeped at one time. After about 60 hours the water is drained off and the swelled grain passes through hatches in the bottom of the steep on to the floor below, i.e., the barn, where it is spread into a "couch"—a heap suitable to the handling and distribution methods used.

In a day or so the grain begins to sprout, and as this proceeds the grain is

strewn out along the malt-barn floor by wooden shovels to give it more "growing" room. After the first day the grain, now green malt, extends to about 10ft from the wall at the receiving end of the barn. After the second day it extends to about 30ft along the floor and at the end of the third day to about 50ft. It is now in a layer about 6in deep, requiring constant attention and turning to keep the temperature in check. A steep is normally let down on to the barn floor every three days. By the time the advancing end of the layer of grain reaches the far end of the barn floor, i.e., eleven days after it leaves the steep, it is fully "grown." The barn floor holds about three "pieces" or "floors." At the far end of the barn, after the eleven days, the malt is shovelled into the boot of another bucket elevator which delivers it to the floor of a kiln two floors up.

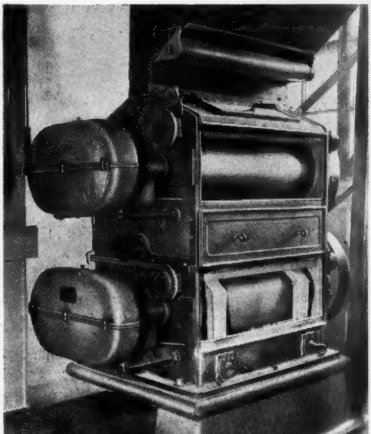


The malt dresser (rear), screw conveyors (part, top left) and elevator are all driven by a 10-h.p. motor

The three bucket elevators serving the dressing machine, the loft conveyor and the kiln, respectively, are all group driven from a 10 h.p. 960 r.p.m. slip ring totally enclosed externally ventilated Brook motor mounted on the loft floor. The motor has an E.A.C. contactor starter fitted with a thermal tripping coil. The motor is self-contained with the initial V-belt transmission scheme with a speed-reducing ratio of about 3 to 1. A countershaft carrying the low-speed pulley is in a structure secured to the same bed rails as the motor. To a projection from these rails is hinged one side of the base plate of the tilted motor. At the other side of the motor base plate (the top in this instance) is hinged an adjusting bolt which extends to a projecting eye on the countershaft unit, and by the adjustment, by means of a nut on the extending bolt, of the position of the hinged motor in relation to the countershaft the correct belt tension is attained.

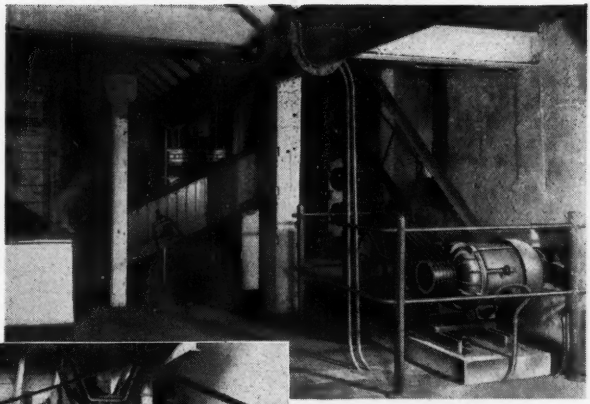
The special value of the scheme lies in the fact that the outfit is the equivalent of a geared motor, with a definite speed ratio, but with belt transmission. From the countershaft, at about a 2 to 3 ratio speed reduction, there is belt transmission to an overhead shaft from which there are separate transmissions to the head drums of the three elevators and to the driving pulleys of the dressing-machine movements.

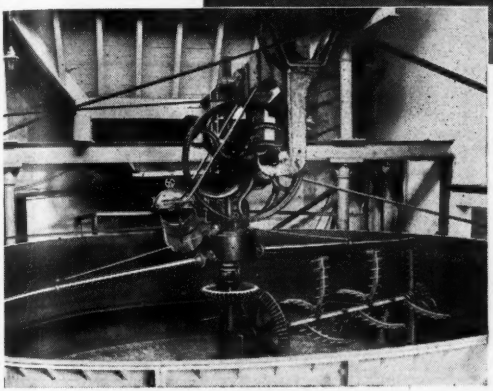
In the kiln the malt is spread over the 26ft square floor to a final layer of about



Malt is coarse-ground by the top rolls and reduced to flour at the bottom of the mill

a foot deep. The kiln floor is of wedge-wire metal with fine louvres through which the fumes from the coke and peat fire underneath pass, to continue up through the bed of malt, thus drying and imparting flavour to the malt. The malt stays in the kiln for about 50 hours, and



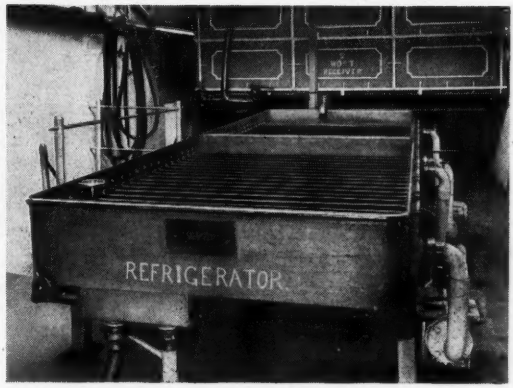


(Above) There is group transmission (30-h.p.) to the drag elevator, mill elevator, mill rolls and ground-malt elevator screw. (Left) In the mash tun stirring is by vertically rotating rakes on a horizontally rotating shaft; mashing machine left of central pulley

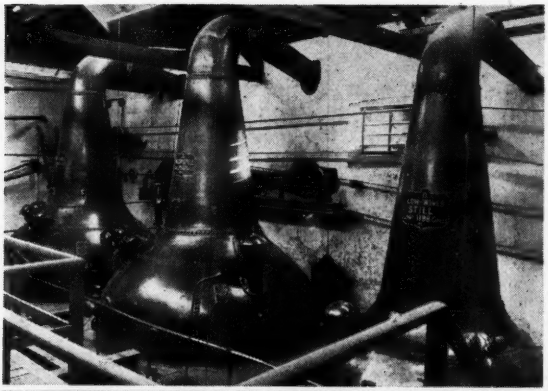
is then shovelled through an opening to a wooden-trough shaker conveyor. The severed rootlets, known as "malt-culms," pass through a mesh or harp in the bottom of the shaker conveyor into a depository below, and are used as cattle food.

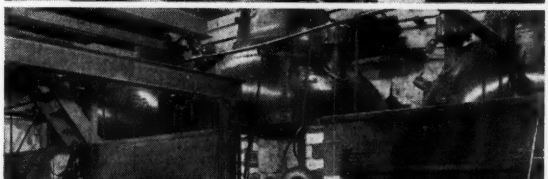
The grain (now malted barley) is passed on by the shaker conveyor to any of a number of hoppers. Thence, as required, the malt is passed on to two feeding lines with screw conveyors serving an elevator which discharges it into a screening drum rather like the barley dresser. The drum, the two screw conveyors and the elevator are all driven by a 10 h.p., 720 r.p.m. s.r. floor-mounted motor. There is a 3 to 1 belt reduction up to an intermediate countershaft, and then another 2 to 1 ratio transmission up to a top countershaft. From this there are four belt transmission schemes down, one to each screw, one to the dresser, and one to the elevator.

At the delivery end of the cooler the wort temperature is 75 deg. F.



From the dresser the malt is fed on to an inclined drag conveyor which delivers the material into a hopper serving a weighing machine, checking the quantity to be mashed later. Thence the malt passes into an elevator which conveys it up for delivery down into a malt-mill on the ground floor. In the mill are two sets of rolls; the malt is ground coarsely between the top two rolls and then to grist between the bottom pair. The grist falls into a short screw conveyor in the boot of the mill which passes it to an elevator to take it to a short screw conveyor serving ground-malt hoppers.





Liquor is boiled in the stills from which the vapour passes to the cooling worm

From a 30 h.p., 1,460 r.p.m. s.r. motor there is group transmission to the drag conveyor, the elevator serving the malt mill, the top and bottom rolls of the mill, the screw conveyor and the elevator. Transmission is first by belt with a 3 to 1 speed-reducing ratio on to a short countershaft. This initial transmission scheme is embodied with the motor in a self-contained unit like the one in the grain loft. Transmission is then by belt up to an overhead countershaft from which there are down transmissions individually to the components referred to. From the bottom roller shaft of the malt mill there is a secondary belt transmission to the screw conveyor in the bottom of the mill.

From the ground-malt hoppers the malt passes into a junction where water is introduced and the mixture is passed to a mashing machine in which it is churned into a thin porridge-like substance. In this form it is delivered into the mash tun—a large cylindrical vat 20ft in diameter. At first the mixture in the tun is stirred by vertically rotating rakes mounted on a horizontally revolving shaft which engages, by means of a pinion, a rack round the inside periphery of the tun. More water is then added and the mash allowed to stand for an hour or more. The liquor is then run off from the tun into an under back—a rectangular tank.

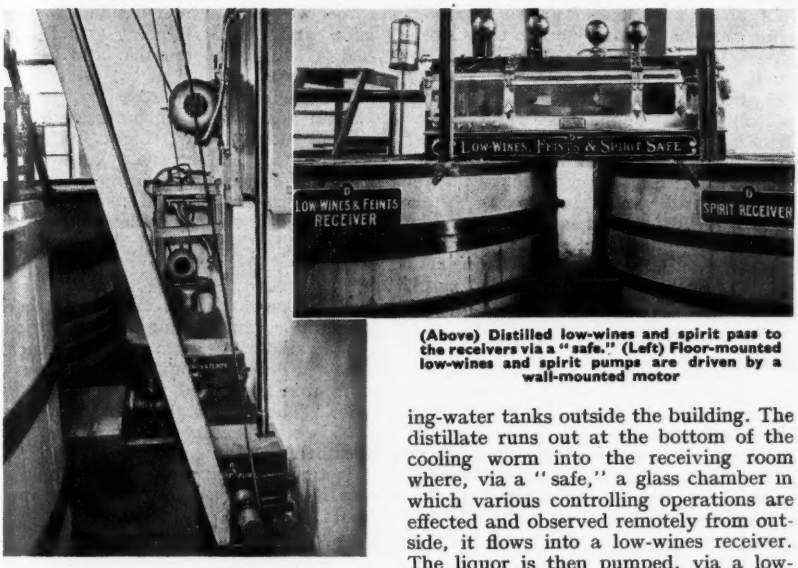
This process is repeated three times and after each operation progressively hotter water is introduced for the next. The mashing machine and the stirrers are driven by a water wheel, for which there is at present a steam-engine stand-by, the transmission embracing change-over pulleys. The remainder (draff) is shovelled through a hatch in the floor of the tun and a drag

conveyor then delivers it outside the building for cattle feeding.

The liquor from the tun is wort and from the under-back this is pumped up to a receiver. Thence flows through cooler, the temperature being reduced to 75 deg F.

The wort is then passed on to any of ten wash-backs, large wooden vessels about 15ft in diameter and 20ft deep. In these wash-backs yeast is added to the wort and fermentation takes place for about 36 hours. To keep the frothy top of the wort in each wash-back under control during fermentation, a "switcher" or paddle revolves horizontally so as to skim the top of the liquor. The ten wash-back switchers are all served from a central shaft which is driven by a 7.5 h.p. 950 r.p.m. s.r. motor with a 5 to 1 speed-reducing belt transmission. The motor and the initial transmission scheme are incorporated in one unit like those described earlier. From the countershaft there is a double-stage transmission, with 2 to 1 speed-reducing ratio in each stage, up to the central shaft.

After fermentation the liquor is pumped to wash chargers, wooden vats about 8ft deep and 18ft in diameter. When required the liquor is passed into the wash stills for the first distillation. The liquor is boiled in the stills and the vapour is passed through the worm, i.e., the progressively narrowing pipe in cooling-water tanks outside the building. The distillate runs out at the bottom of the cooling worm into the receiving room where, via a "safe," a glass chamber in which various controlling operations are effected and observed remotely from outside, it flows into a low-wines receiver. The liquor is then pumped, via a low-wines charger, back to other stills for the second distillation, and returns as spirit. A 2 h.p. motor bracketed on the wall at the back of the low-wines and spirit receivers belt drives two floor-mounted pumps, one pump handling the low-wines and the other the spirit. There is a first belt transmission with a 3 to 1 ratio speed reduction up to an overhead shaft and then two speed-raising transmissions (about 1 to 5) to each pump.



(Above) Distilled low-wines and spirit pass to the receivers via a "safe." (Left) Floor-mounted low-wines and spirit pumps are driven by a wall-mounted motor

After the first distillation spent wash (waste) is left in the still. This is run out to a tank from which it is pumped to a loading tank ready for disposal. From the spirit receiver the spirit is run out into casks which are passed on to the bonded warehouses.

All the motors in this installation were supplied by Brook Motors, Ltd.

We are indebted to Mr. P. J. C. Grant, managing director, for permission to visit the distillery and to publish this article and to Mr. J. F. Taylor, the brewer, for his assistance.

Views on the News

By REFLECTOR

ONCE again the Minister of Fuel and Power finds himself unable to permit shop-window lighting during the Christmas season, and once again I must express my regret that relaxation is not possible at what used to be the festive season. But I suppose that most of the lighting would be needed during the later peak hours, and if "after-peak" lighting were permitted it would be difficult to ensure that all shopkeepers stuck to the rules. In this, as well as other directions, adequate plant is the only solution. Although in view of recent rationing concessions the quotation is somewhat inapt, it's always jam to-morrow and never jam to-day.

★ ★ ★

In the matter of Christmas tree lights, the Ministry of Fuel and Power has made one of its nice distinctions. Fairy lamps may be used on trees erected for religious, charitable and civic purposes but shops and hotels which are secular and, presumably, uncharitable and uncivic, are barred from this harmless custom.

★ ★ ★

The British Electricity Authority has found it necessary to contradict a rumour that it proposes to begin supplying electric lamps to consumers. A B.E.A. "spokesman" told the Press Association "It is not our province." He went on to say, however, that it might be the province of the provinces (i.e., the Electricity Boards) if any of their former undertakings had been in the habit of providing lamps in the past. To the man in the street, of course, this will be a distinction without a difference; he will never grasp the division of duties and responsibilities under the new "set-up."

★ ★ ★

"Sixty Years of Progress in Queensland," an interesting pictorial brochure, dispels any illusions which we in this country might have of marked seniority over the Dominions in public electricity supply. It was only a matter of months after the first supply was established in England in 1882 (at Brighton) that Queensland had its first demonstration. This consisted of eight arc lamps in Queen Street supplied from a dynamo in Adelaide Street, the date being 11th December, 1882. Four months later electric lighting was installed at the Government Printing Office. In 1887 the firm of Barton and White (predecessors of the present City Electric Light Co., Ltd.) was formed, and in the following year gave the first public supply to the General Post Office and several nearby shops. The power house was situated in Edison Lane and the original building still stands to-day.

★ ★ ★

Developments in electrical contracting since the nationalization of the electricity supply industry seem to be inducing many installation practitioners, genuine and otherwise, to "get in out of the rain." The Electrical Contractors' Association reports a record accession of new members, and the Birmingham Branch says that it is finding it difficult "to stem the tide of obviously unsatisfactory applicants."

★ ★ ★

The Birmingham Branch has also had something to say about the brevity of the period between a call for tenders and the closing date. This is a long-standing grievance with, usually, a simple remedy. Jobs of any size are not planned a week or two before they are required to be commenced; they are generally cut and dried long before and there is no reason why calls for tenders should be held up. Short-dated calls favour those tenderers with ample staff to prepare schemes and specifications; or, conversely, those who operate on speculation or guesswork rather than by sound estimating. It is the contractors in between who are the sufferers.

★ ★ ★

Two weeks ago I referred to electricity works specially designed for handling "gum." Now I see in the *Electrical World* (New York) that a station now using anthracite silt formerly used "stoker-fired Barley and Rice." I gather from the context that these are other grades of anthracite—not cereals.

Magnetic Amplifiers

TWO I.E.E. MEASUREMENTS SECTION PAPERS

THE subject of two Measurements Section papers which were read at an extremely well-attended ordinary meeting of the Institution of Electrical Engineers in London last week was magnetic amplifiers, or transductors, as they are sometimes called.

MR. A. G. MILNES (R.A.E.) gives typical performance figures for the d.c. controlled saturable-core reactors which were successfully used by Germany during the recent war for the amplification and mixing of powers down to a microwatt. The basic principle of operation is explained, and the turns-ratio law relating output current and input signal excitation is derived for a core of infinite permeability. An analysis is made of the transductor's behaviour on short circuit with a discussion of the non-dimensional plotting of characteristics.

Permeability Effects

The effect of permeability on performance is illustrated with curves for various materials, showing that for power gains of 10 to 20 per stage high permeability cores must be used, in which case with positive feedback a power amplification of 2,000 or more is possible. Arrangements to give duo-directional amplifiers are dealt with, followed by some notes on selenium rectifiers, which are normally used in transductor circuits as their rating is higher than that of copper-oxide ones and for use in aircraft they can be made very light in weight.

The fundamental principles of design are developed in which power output, amplification and time lag are related to supply frequency, core area and self-excitation or feedback, indicating that time constants are directly proportional to power amplification and inversely so to supply frequency and positive feedback. It is thus possible to obtain a high amplification/time-constant ratio by using a high supply frequency and in cascade a number of stages having positive feedback. The author concludes that the transductor, like the electronic amplifier, has its limitations, but it is a valuable addition to circuit technique for the amplification of d.c. powers down to about 10^{-9} W.

The second paper, prepared by MESSRS. H. M. GALE and P. D. ATKINSON (both of Elliott Brothers (London), Ltd.), records a theoretical and experimental study of series-connected magnetic amplifiers, providing a simple explanation of the operation of two important types both under steady state and transient conditions. The theory of operation is extended, with particular reference to the factors governing delay, which limits the usefulness of the device in high performance servomechanisms and similar applications.

Mathematical analysis is made difficult by the non-linear characteristics of the iron, but by neglecting leakage reactance and assuming an ideal B/H characteristic a solution is obtained which shows that the steady-state and transient operation of an amplifier having one of the two basic circuits analysed depends on only three dimensional coefficients. This solution leads to simple semi-graphical methods of determining the steady-state current and flux waveforms and the response to sudden changes in input, satisfactory agreement between experimental results and theory having been obtained. Amplifiers can therefore be designed to meet specific requirements and the speed of response, which is often an important factor in practical applications, can be calculated. By means of special circuits the response time of simple amplifiers can in some cases be reduced by as much as ten to one.

DISCUSSION

Opening the subsequent discussion, MR. C. S. HUDSON (R.A.E.) said that in 1944 he initiated work at the R.A.E. which was largely concerned with magnetic amplifiers working at 400 c/s, and with the series type of transductor rather than the parallel type, as having a better time constant. They had used the series type of self-excitation, but were tending to use the bias type, because they were working with a variable supply voltage and frequency and with a very large

range of ambient temperature. If they biased to the working point, effecting amplification by true positive feedback, a much more stable amplifier was obtained with a better time constant than the self-excited type. It was discovered at an early stage that conventional laminations did not give very good characteristics, and following an examination of German amplifiers a range of laminations was created with extremely good response characteristics, the I-piece being eliminated and an endeavour made to avoid differential saturation round the magnetic circuit.

MR. W. F. RANDALL (Institute of Metals) said that modern magnetic materials took advantage of the improvement which could be obtained by orientation of the grain of the strip, because if stampings were used the full B/H curve would never be achieved. He pleaded for more consideration of the rolled strip core. Gale and Atkinson said that core material should combine high saturation intensity, low high-frequency losses, a sharp knee and a flat top to the B/H curve, high permeability and cheapness. The silicon-iron alloys had the highest saturation, but with the nickel-iron alloys very low losses could be achieved and they could be rolled down to one mil or less.

Stability of Input Level

MR. J. F. COALES (Elliott Bros.) said that the papers did scant justice to magnetic circuits because they had been treated simply as amplifiers of transient phenomena. When dealing with the amplification of the steady state it was necessary to think in terms of stability of the input level, a modulator being almost always employed before amplification to minimize drift. Magnetic amplifiers could perhaps be classed as modulators followed by different methods of amplification.

DR. R. WILLHEIM (Electro Methods) referred to a new core material, known as H.C.R., which had been developed in America and had a steep slope together with a high saturation level. Measurements supported the claims made for it, but it was questionable whether the saturation was as complete as with Mumetal.

MR. F. H. BELSEY (Metropolitan-Vickers) remarked that both papers considered the series transductor with a large choke in the d.c. circuit, but this type was rarely used except in certain d.c. transformer applications and it would be more profitable to concentrate on the series type with low resistance input or with feedback, or the parallel type, all of which had the same kind of waveform with resistance load.

MR. A. J. HASELFOOT (A.S.E.A.) thought that the treatment adopted by Milnes was cumbersome and his equations likely to prove intractable, particularly where Mumetal was used. A better approach was made in the method used by Gale and Atkinson. Another method consisted of equating the area under the voltage curve to the changes in flux which occurred.

Time-Constant and Response Time

MR. F. E. BUTCHER (Electro Methods) agreed with the statements made in both papers with regard to time-constant, but said that it should be borne in mind that in many cases it was not the time-constant but the response time which was of interest.

MR. E. H. FROST SMITH (University College, London) did not agree with Mr. Milnes that no saving in weight occurred with the three-limb construction rather than having all the windings on the centre limb. The control winding would be shorter, so that fewer air gaps would be traversed by the alternating flux. Moreover, it was possible to build this type of core with permanent magnets to achieve, among other things, asymmetrical output and distinguish between positive and negative signals.

MESSRS. A. BUTTERWORTH and D. A. BELL also took part in the discussion and the authors briefly replied.

Pulverized Fuel Conference

A THIRD and final volume of the report of the Conference on Pulverized Fuel held at Harrogate in June, 1947, has been issued by the Institute of Fuel. The volumes are indexed and contain some papers covering every aspect of the preparation, properties and utilization of pulverized fuel, the discussion of which is recorded in the present volume. Complete sets may be obtained on application to the Institute at 18, Devonshire Street, London, W.1, at 42s each.

School Laboratory Equipment

Low Voltage A.C./D.C. Power Unit

By C. A. BELCHER, A.M.I.E.E.

THE demands of science teaching in the greatly increased number of secondary schools has resulted in the need for an efficient source of low voltage a.c./d.c. power for experimental purposes in science laboratories. This has presented the London County Council with a problem which has been solved by the development of a compact wall-mounting unit capable of providing a.c. or d.c. up to 600 VA with smooth control of voltage from zero to 18 V for feeding a ring-main circuit and distributing to fused terminal blocks on the laboratory benches.

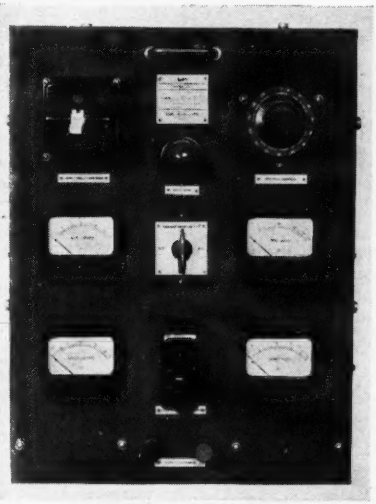


Fig. 1—Control unit for converting a.c. to d.c.

It was decided that a main unit under the control of the instructor was safer and more economical than the employment of ten or twelve small units for bench use. A full-wave rectified d.c. supply in lieu of a large capacity secondary battery, with its attendant charging and maintenance problems, was selected as providing the most practical way of satisfying the demand of the large number of science laboratories in secondary schools that are being created under the most recent Education Act.

These schools require both a.c. and d.c. power at laboratory benches for general science classes and for lighting small microscope lamps in biology laboratories —applications which demand a supply which is both flexible and safe without risk of shock.

Following a series of tests using the recently developed heavy-duty funnel-

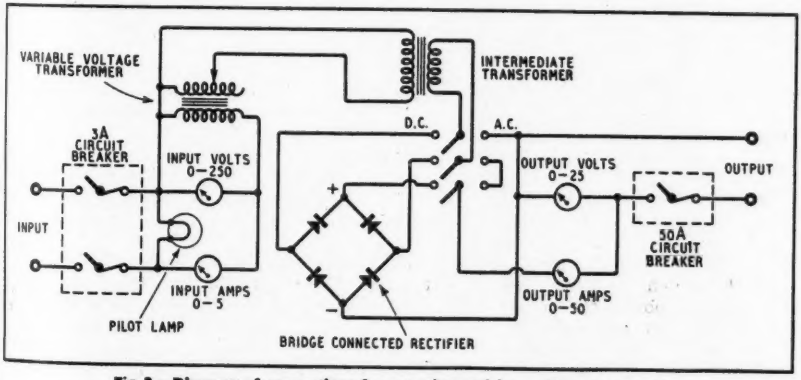


Fig. 2.—Diagram of connections for experimental low-voltage d.c. supply

cooled selenium rectifier, a design was worked out embodying a number of commercially obtainable components resulting in the production of the model illustrated in Fig. 1, the connections for which are indicated in Fig. 2. The overall dimensions of the unit are 26in high by 20in wide by 15in forward projection.

The single-phase a.c. supply is taken from an adjacent three-pin 13 A socket-outlet to a totally enclosed isolating switch mounted inside the case and interlocked with the hinged front panel. A miniature Nalder circuit breaker controls a "Variac" auto-transformer regulating the pressure from zero to 270 V across the primary winding of a double-wound step down intermediate transformer, the secondary winding of which is connected to a rotary change-over switch. In the a.c. position the rotary switch connects the variable voltage a.c. supply to the output terminals on the panel *via* a 60-A "Atlas" circuit breaker fitted with magnetic and thermal overload releases. When switched to the d.c. position the supply is connected to two funnel-cooled "Sentercel" selenium rectifier stacks in bridge connection providing the d.c. supply, which is available at the common output terminals.

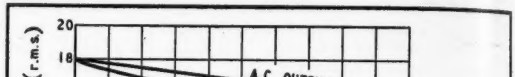


Fig. 4.—Regulation curves for constant-input volts and one setting of "Variac" control, readings being constant for both resistive and inductive loads

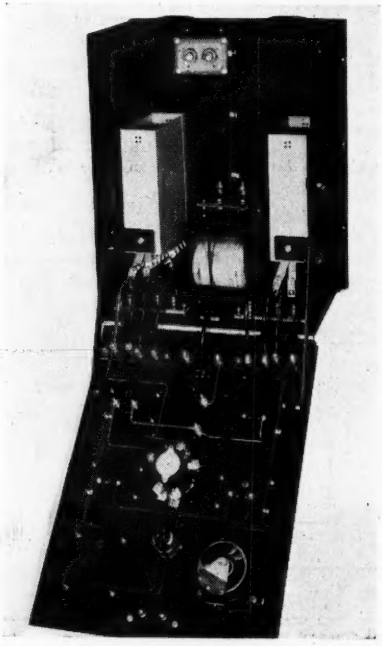


Fig. 3.—Interior of power unit

The Pullin input and output ammeters and voltmeters are of the moving-iron type calibrated for a.c./d.c. use with wide scales clearly visible for class teaching. A red pilot lamp indicates excitation of the auto-transformer when the input circuit breaker is closed. Adequate cooling of the rectifier units is provided by means of ventilation louvres in the top and bottom of the case, which is black enamelled and provided with a "crackle" finish.

In order to give the installation its maximum value for teaching purposes, the front panel is hinged at the bottom edge to open through 140 deg to expose the component parts and wiring, as shown in Fig. 3, the latter being colour coded—green for a.c., red and black for d.c. The interlocked isolating switch renders the unit "dead" and quite safe to touch should the plug be left inadvertently in the wall socket.

Distribution in each laboratory is carried out by a 7/.044in ring-main circuit, permanently connected to the output terminal studs at the rear of the panel, leaving the front terminals for charging the small secondary cells which are part

of the normal school equipment. Terminal blocks with 5-A fuses fed from the ring main are attached to the students' benches and demonstration table. In general purpose classrooms which are provided with movable benches, the distribution is made flexible by using fuse-controlled non-reversible socket-outlets mounted at convenient positions on the walls, connection being made to the benches by means of flexible t.r.s. cables plugging into bench sockets which are mounted on blocks each with a pair of terminals for students' use.

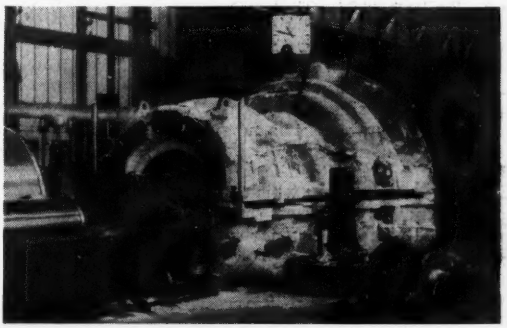
The indication of r.m.s. values of voltage and current by panel instruments is appreciated by the teaching staff. A form-factor of 1.15 is used for conversion to mean values when required for d.c. experiments; normally, however, this should not be required as suitable pattern instruments will be available on the benches for students' use. The voltage regulation is reasonably good, as will be seen from the voltage-current curves in Fig. 4. The smooth and ready control of the output voltage provided by the "Variac" transformer is of considerable value in maintaining more constant pressure if specially required.

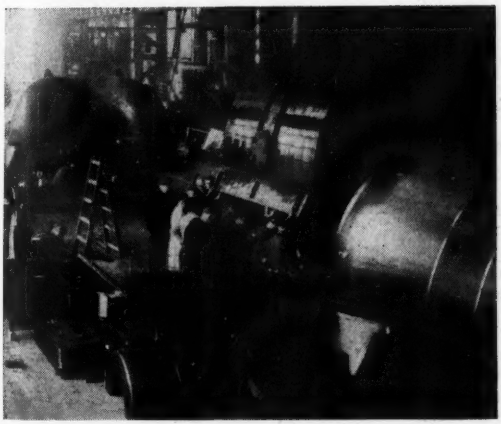
The unit shown has been manufactured by Legg Industries, Ltd., to the specification and design of the L.C.C. Chief Engineer's Department, to meet the requirements of the Council's Education Officer.

Repairs at Dunston

COMPOSITE SET COMMISSIONED IN FOUR DAYS

WORKING day and night since Sunday, 28th November, engineers of the British Electricity Authority successfully brought into operation by the evening of Thursday, 2nd December, a 50,000-kW turbo-generator at Dunston power station, near Newcastle. This they did by coupling up the stator of one machine that was out of commission, with the turbine section of another set on which a fault developed recently. Both sets had been in practically continuous operation for about sixteen years.





Above: The damaged machine. Left: Stator being placed in position

The engineers shifted the unimpaired 110-ton stator of the alternator along the station floor and coupled and aligned it to the sound turbine unit in four days. Thus 50,000 kW of generating capacity has been brought back into operation in the space of about four days.

The Oscillograph

APPLICATIONS IN POWER ENGINEERING

TWO papers were read at a joint meeting of the Measurements and Supply Sections of the I.E.E. last week which dealt with specific applications of the oscillograph to electrical power engineering.

The first of these, prepared by MR. W. T. J. ATKINS (B.E.A.), describes an instrument for automatically recording disturbances on supply systems which is capable of giving detailed service records of modern high-speed switchgear and protective equipment. The author stresses the difficulty of analysing supply network faults and other abnormal conditions, mentioning some of the earlier oscillographs used for this purpose.

The fully automatic device of the type used by the B.E.A. is then described, in which the traces on 15 cathode-ray tubes, housed in a common camera, may be photographed side by side on a 70mm film. This equipment is normally quiescent, the tubes being blacked out, but any abrupt change of the supply voltage influences a detector which initiates the cathode beams and starts the film-driving motor. Recording is effective from the commencement of the system disturbance as an electronic sweep of the cathode-ray beams anticipates and merges into the mechanical acceleration of the film. On selected elements, time-delay networks are incorporated to provide signal storage and to enable events preceding the disturbance by about one microsec. to be included in the records. A code number for the date and time of each operation is marked against the corresponding record.

In conclusion Mr. Atkins expresses the opinion that there is a wide field of applications for equipment designed on these lines whereby a reasonably large number of records may be obtained from a single compact unit, with the facility in use which the cathode-ray tube offers.

The second paper, prepared by MESSRS. E. L. WHITE and W. NETHERCOT (both of E.R.A.), deals with the recurrent-surge oscillograph and its use in the study of surge phenomena in transformers, interest in which has been stimulated by the increasing attention devoted to the impulse strength of transformers. Experimental methods of investigation in this field of activity necessitate the use of the cathode-ray oscillograph, and for transformer work the recurrent-surge type has important advantages. As low voltages are used there is no risk of damage to the transformer, and the recurring trace is suitable for visual observation and eliminates most of the difficulties associated with single transient recording. The authors assess the value of the instrument for transformer investigations, dealing briefly with its development and design and expressing the opinion that it could with advantage be more widely used in industry. The latest E.R.A. instrument of this type is also described.

In conclusion, methods of applying the recurrent-surge oscillograph to transformers are discussed and its position apropos transformer research is reviewed, principally with reference to the work of E.R.A.

Gas Turbines in Industry

THE gas turbine for industrial power generation is the subject of a paper presented by Mr. R. G. Voysey last week to the Manchester Association of Engineers. In the author's own words it has been compiled with "the usual smattering of theory, snippets of practice and blend of hope and gloom for the prospects."

Commencing with the assumption that one end of the machine is not too dissimilar in design and behaviour to a steam turbine, the main endeavour has been to explain the influence on overall efficiency of such components as the compressor, intercooler and heat exchangers; how they may be split up into several stages and so disposed as to improve the "very poor" simple cycle in part-load industrial operation.

Figures are not quoted, but the author intimates that a gas-turbine installation need not necessarily be more expensive than a steam-turbine equivalent, if the cost of boilers is added; if the cost of buildings and cooling water arrangements is included, then the balance is definitely in favour of the gas turbine, while maintenance costs should not be unfavourable. The fuel problem is complex and no simple or complete solution can be foreseen.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Court of the University of St. Andrews announces the appointment of Professor **E. G. Cullwick,** M.A., as first Watson-Watt Professor of Electrical Engineering at University College, Dundee. Professor Cullwick was educated at Wolverhampton Grammar School and at Downing College, Cambridge. After serving a student apprenticeship with the British Thomson-Houston Co., Ltd., Rugby, he went to Canada in 1926 to take up an appointment with the Canadian General Electric Co. He was appointed Assistant Professor of Electrical Engineering at the University of British Columbia in 1928 where he was later Associate Professor, and in 1937 he was appointed Professor at the University of Alberta.

During the war he acted as Director of Electrical Engineering, Naval Service Headquarters, Ottawa, and is at present Director of Electrical Research, Defence Research Board, Department of Defence, Ottawa. Professor Cullwick has published various research papers, and is the author of "The Fundamentals of Electromagnetism." It is hoped he will take up his duties on 1st May, 1949.

Mr. C. O. Brettelle, M.I.E.E., who has been technical editor of the *Electrical Review* for about twenty years, retires from

Mr. C. O. Brettelle

Mr. W. O. Fenwick

that position this month. He is succeeded by his technical assistant, **Mr. W. O. Fenwick,** M.I.E.E. Mr. Brettelle will continue his association with this journal as a technical consultant and is still on the board of the company.

Mr. R. P. Middleton has resigned from the board and from the company of F. H. Wheeler (Sheffield), Ltd. He has been connected with the Wheeler organization for nearly nineteen years in the electrical contracting industry, and has been general manager, and general manager and director of F. H. Wheeler (Sheffield), Ltd., since its inception just over three years ago.

Mr. L. Victor Levett has been appointed by Laurence, Scott & Electromotors, Ltd., to their London office, where he will be in charge of industrial sales. Mr. Levett recently resigned his position with the English Electric Co., Ltd., which he represented in the London area for the past ten years. The marine sales activities of L.S.E. in the London area remain in charge of Mr. J. A. Affleck.

Mr. L. V. Levett

Mr. E. H. Bliss has been appointed a director of Pirelli-General Cable Works, Ltd., in succession to **Mr. A. R. Sadler,** who has resigned.

Mr. George Wansbrough has announced his decision to vacate the chair of the board of A. Reyrolle & Co., Ltd., to facilitate the Board of Trade inquiry ordered on Monday last (see "Financial Section," page 924). Sir Claude Gibb, deputy chairman, will take the chair, but Mr. Wansbrough will remain on the board. The company states that it did not oppose the motion for the appointment of an inspector and welcomes the fullest investigation.

Mr. C. R. Heathcock, a member of the Midlands Electricity Board and former chairman of the West Midlands Joint Electricity Authority, has been elected president of the Chartered Institute of Secretaries for the ensuing year.

Mr. C. H. Nicholson, who, as reported in our last issue, has been appointed a member of the "working party" on port mechanization, is a full member of the Institutions of Electrical and Mechanical Engineers—not an associate member.

Mr. J. W. Wardell, general manager of Scattergood & Johnson, Ltd., has been appointed a director of the company.

Mr. H. S. Snowball, deputy engineer and manager of Sunderland Corporation Transport Department, has been appointed general manager of the undertaking in succession to the late **Mr. C. A. Hopkins.** Mr. Snowball served his apprenticeship with George Clark, Ltd., engineers, and was later

with the Parsons Marine Steam Turbine Co., Ltd., Richardsons, Westgarth and Co., Ltd., and the Consolidated Pneumatic Tool Co., and from 1917 to 1920 he was general manager of the National Filling Factory, Banbury. He was afterwards appointed manager of the Moor Engineering and Pipe Works, Sunderland, and in 1926 became rolling stock superintendent with Sunderland Corporation Transport Department. Three years ago he was appointed assistant manager and since Mr Hopkins' death he has been acting-manager.

Speaking at the annual dinner of the **Ipswich & District Electrical Association,** held at the Great White Horse Hotel, Ipswich, on 3rd December, Mr. C. T. Melling, chairman of the Eastern Electricity Board, and president of the Association, said that there was plenty of electricity to sell to all comers provided they asked for it at the right time. Mr. G. A. Vowles, divisional controller, Yorkshire Division, B.E.A., said that in spite of appeals to economize, the demand for electricity was going up at the rate of 10 per cent per annum, roughly the figure it was before the war. In spite of all the appeals, people were still insisting on at least their measure of the most modern and still the cheapest form of energy. Mr. T. G. N. Haldane, president of the Institution of Electrical Engineers, said that restriction of the use of electricity had perhaps taught people more than anything else its value. The guests were welcomed by Mr. P. C. Dean, chairman of the Association.

About 400 people attended the joint dance of the Graduates and Students' Sections of the Institutions of Civil, Mechanical and Electrical Engineers held on 3rd December at the Chelsea Town Hall. Mr. Robbins, the assistant secretary of the Institution of Mechanical Engineers, and Mrs. Robbins, were among the guests, and Mrs. Robbins presented the prizes. Music was provided by Chris Stone and his orchestra.

Obituary

Mr. A. E. Springer.—The death occurred on 28th November, after a short illness, of Mr. A. E. Springer, superintendent of general outside contracts in the London area for Johnson & Phillips, Ltd. Mr. Springer had been on the contract staff of the company for thirty-seven years.

Mr. E. H. Parker, a partner in the firm of Beckett and Parker, Ltd., electrical instrument manufacturers, of Tummer Lane, Birmingham, died on 1st December at his home at Olton at the age of seventy-two.

Dr. H. J. van der Bijl.—The death has occurred in Johannesburg at the age of sixty-one of Dr. Hendrik Johannes van der Bijl, M.A., Ph.D., the well-known South African industrialist and physicist, and chairman of the Electricity Supply Commission of South Africa. Dr. van der Bijl was born in Pretoria and was educated at the University of Leipzig. He established a reputation as a research physicist in Europe and later in America, and was a pioneer of radio telephony. In 1920 he was persuaded by General Smuts to return to South Africa to become technical adviser on industrial development to the Department of Mines and Industries. He was intimately connected with the framing of the South African Electricity Act, and when the Electricity Supply Commission was formed in 1923 he was appointed chairman. Dr. van der Bijl played a leading part in the industrial development of the Union, and was chairman of the South African Iron and Steel Industrial Corporation, Ltd., African Metals Corporation, Ltd., and the Vanderbijl Engineering Corporation, Ltd., and was associated with many other important industries. During the last war he was Director-General of Supplies, a position carrying Ministerial rank. He visited this country in 1946 to advise the Minister of Supply on the nationalization of the iron and steel industry.

The late Dr. H. J. van der Bijl

Wills.—Mr. W. G. Newberry, M.I.E.E., group secretary with the British Electrical and Allied Manufacturers' Association, who died on 4th September last, left £10,397 (£10,233 net).

Mr. W. H. Duffett, M.I.E.E., M.I.Mech.E., senior executive officer in Rotherham of the British Electricity Authority, previously engineer and general manager of the Rotherham Corporation Electricity Department, who died on 19th June last, left £19,862 (£17,724 net).

Mr. W. K. Whigham, O.B.E., a member of the Central Electricity Board, who died on 14th August, left £427,277 (£382,587 net).

Mr. S. G. Brown, F.R.S., M.I.E.E., founder and late chairman of the Telegraph Condenser Co., Ltd., and former proprietor and director of S. G. Brown, Ltd., who died on 7th August last, left £140,761 (£138,229 net).

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Thermostat Settings

I HAD hoped on reading your editorial of 26th November on the importance of low temperature settings that it would be backed by an article or some fuller contribution later in the same issue. This does not appear to be the case, but certainly the matter to which you draw attention deserves the greatest emphasis which can be brought to bear and you rightly stress the saving in energy consumption by dropping the "target temperature."

There is, however, the other aspect of a contribution towards peak load reduction. For, at least, glasshouse purposes a reduction of "target temperature" permits an equivalent reduction in installed load. This is some, if slight, consideration even in the days to which we look forward. Incidentally, it has been found that even a 10 deg F reduction in glasshouse temperature is often practicable; glasshouses traditionally run to attempt 60 deg F have been operated quite happily electrically with thermostat settings of 50 deg F.

That the Northmet Sub-Area of the Eastern Board should be emphasizing this point is in keeping with the great part played in all this work by Mr. R. Grierson. His masterly contribution to the subject in the form of "Degree Days" has been highly appreciated by all concerned with glasshouse heating.

C. A. CAMERON BROWN.

Northwood, Middx.

Background Knowledge

THE subject of the editorial in your issue of 3rd December is of vital importance to-day, the experience of the "engineers and their fellow men" with some background knowledge who are now in the nationalized industries would be very interesting. I know of an engineer subordinate to a so-called specialist, fifteen years his junior, when trying to reason with him was told not to be so argumentative.

If specialization is carried too far, where are we going to get our administrators from in the future? Specialists, of course, we must have, but their numbers should be limited and surely their duties should be confined mainly to teaching and writing. The adaptation of their ideas should be left to the more practical minds.

I wonder if it is possible to get an authoritive opinion from some of your readers as to the minimum amount and kind of reading that would develop the necessary background for an engineer, particularly for those who are now part of a great nationalized industry. Would an engineer's library be complete without the late Sir James Frazer's *The Golden Bough* or the latest works of Sir Arthur Keith and Bertrand Russell and even some of the writings of Freud and Jung. If there are any of my fellow men who are now doubtful about their sanity, I could suggest one or two books on "Nerves and the Nervous."

The late Herbert Spencer in his book *Education*, first published in 1878, deals with this subject and claims that every thinking person must be to some extent a philosopher, but the subject is so vast that one is likely to stray beyond the scope of your journal. I therefore enclose my pre-vesting day card and sign myself

C. E. O.

Fine-gauge Copper Wires

FURTHER to my letter published on 12th November, I am pleased to see that in your issue of the 26th November I am given some support. While still favouring the old 35/40 I am reluctantly prepared to accept the 0.0076 stranded flexible. T.r.s. flexible made up with strands of this gauge and with heel cord to take up pulling strain, is reasonably satisfactory.

It is possible with the arcing that takes place across a broken flexible for the rubber to be so softened that a strand can poke through, especially if it is of 0.012 gauge. I am wondering if the 14-strand cable mentioned by "Cautious" contained two or three strands of steel wire which some manufacturers use to prevent stretching, instead of heel cords. Whether this was so or not, I suggest that H.M. Factory Inspector should pro-

hibit the use of 0.012 gauge strands on all t.r.s. flexibles up to say a cable area of 0.007 sq in when used on 230-V a.c. circuits.

I touched on car flexibles in my letter and I would point out to Mr. Rist that I was aware of the changes of gauge before the war. The weakness in the modern car wiring is in the loom or harness system. This system embodies the use of the correct length cable to each component bunched up together and braided with a cotton braiding. This loom is satisfactory where rigidly attached to frame or chassis, but it is at the points where cables branch off and are unsupported that the trouble and breaks occur, by flexing. I fail to see the advantage of a fewer number of strands of larger gauge helping to eliminate this trouble. American cars have 6-V systems which require heavy section wire to avoid voltage drop.

Mr. Rist's firm may have put forward this suggestion of larger strand wires and got it accepted. Unfortunately during the war, Government Departments were inclined to accept manufacturers' points of view, and this was backed by the influx of ex-factory officials into the temporary ranks of the Civil Service, the consumer getting no voice in the matter.

Yeovil. C. J. BENNETT,
Chartered Electrical Engineer.

Asynchronous Generators

IN the editorial of your issue of the 12th November you state that you cannot recall the use of asynchronous generators connected to the mains.

The shortage of electricity has stimulated interest in this type of generator used in this way, as evinced by recent articles and papers on this subject and inquiries for such machines which manufacturers are receiving.

In several countries asynchronous generators are operating on public mains and more are under construction. The machines mentioned below have been made or are being made by the company with which I am associated, but I know that other manufacturers of induction machines could quote similar instances.

Example E quoted in the Ministry of Fuel and Power's leaflet F.E.G. 360/11 is based on a 94-kW asynchronous generator which has been operating for two years at an oil refinery in Trafford Park. A 1,390-kW 6,600-V asynchronous generator is under construction for a large gas works in the London area.

Long deliveries of new machines and the predominance of induction motors over synchronous alternators in the second-hand market have facilitated the increasing use of induction machines as asynchronous generators. One L.D.C. machine, after 20 years' use as a 125-h.p. motor in a cement works, is now installed as a 100-kW asynchronous generator in a new timber mill in Widnes.

On the one hand the fact that an asynchronous generator is dependent on the public mains for its excitation is a disadvantage in some respects, but on the other this feature removes the risk that the generator may keep a section of public network alive should the supply authority need to isolate it.

Another disadvantage of the asynchronous generator, which I find tends to be overlooked, is that while it reduces the kW load taken from the public mains, the latter still has to supply all the wattless lagging current of the factory load, plus the exciting current of the asynchronous generator. However, power factor can be corrected by condensers, providing they are correctly disposed so that no dynamo-electric machine is "over-condensered."

P. HUGGINS,
Chief Electrical Designer,
LANCASHIRE DYNAMO & CRYPTO, LTD.,
Trafford Park,
Manchester.

An Idea for E.I.B.A.

ONE response to the suggested competition asking for ideas as to how the Electrical Industries Benevolent Association could be provided with funds to meet its increasing tasks is the suggestion that those people who have had covenants running in aid of hospitals and other bodies, and who are, as the result of the National Health Scheme, terminating those covenants, should transfer this income to E.I.B.A., whose work, in spite of the National Health Scheme, is growing by leaps and bounds.

H. SENIOR FOTHERGILL,
Secretary.
32, *Old Burlington St., W.1.*

Building Specialists

THE Federation of Associations of Specialists and Sub-Contractors (of which the Electrical Contractors' Association and the E.C.A. of Scotland are members) held its annual luncheon at the Dorchester Hotel, London, W.1, on 2nd December. Mr. W. R. Cowen (chairman of Council) presided and proposed the toast of "H.M. Government." Making special reference to the Minister of Works, the Rt. Hon. C. W. Key, who was the guest of honour, Mr. Cowen said that largely through the co-operation of the Ministry with the building industry that industry's future was brighter than seemed possible a year ago. They all welcomed the relaxation of control which had been made within the last six months.

He believed that steps were being taken to ensure a more balanced building programme which would conduce to the better efficiency of the industry and enable a balanced force of craftsmen to be maintained.

Relaxation of Control

In the course of his reply, Mr. Key referred to the progressive raising of the amount of building work which could be carried out without a licence. He said that the position would again be reviewed sooner or later.

The W.B.A. scheme of distribution of materials and components had ended but before it was forgotten he wished to place on record his appreciation of the co-operation of the Federation in this matter. Steel and timber were still difficult to obtain but he looked forward to further decontrol step by step.

Valuable work had been done by the Building Apprenticeship and Training Council. The new Apprenticeship Training Council for the Electrical Contracting Industry had a big task before it, but he was sure that it would achieve success.

There should be about 20,000 recruits annually to the building industry, but the numbers were falling far short of that. Grounds for uncertainty regarding the future of the industry no longer existed. The programme permitted the full intake of apprentices to maintain a skilled labour force.

He agreed that a balanced programme was needed, but at present emphasis had to be on housing. But although more than 750,000 houses had been made available since the war there had also been spent on commercial, industrial and agricultural buildings a total of £426 million. Mr. Key paid a tribute to the Building Advisory Council for the assistance which it had afforded the Ministry

The health of the guests was proposed by Mr. H. Blackman (chairman of Council) and the response was by Mr. A. B. Knapp-Fisher, vice-president of the Royal Institute of British Architects.

Electricians' Wages

IN its Award No. 1182 the National Arbitration Tribunal sets out the claim of the Electrical Trades Union for an increase of 10s per week in the wages of its members employed in the electrical contracting industry, and the reply of the National Federated Electrical Association contends that there had been no increase in the cost of living to justify higher wages than those fixed in November, 1947. In the result the Tribunal awards an increase of 1d per hour in journeymen electricians' wages, with corresponding rises in those of mates and workers under 21 years of age.

Following the award the N.F.E.A. has circulated schedules of the new rates to its members. The total rate for the Grade "A" Area is now 3s 2d per hour; for the Mersey District 2s 11½d; and for Grade "B" Areas 2s 10½d, including the temporary hourly addition of 9d in each case. Adult mates are entitled to the full hourly addition, and in the Bristol and London Areas 80 per cent of the journeyman's basic rate, and in other areas 75 per cent.

Christmas Holiday

As Christmas Day falls on a Saturday this year pay arrangements are somewhat complicated. Briefly, those men working a five-day week are not entitled to any wages for Christmas Day if they are not called upon to work. Those working a 5½-day week normally work four hours on a Saturday and are therefore entitled to four hours' pay if they are not called upon to work. For Boxing Day, 27th December (a normal working day) all operatives not required to work are entitled to a normal day's wages.

Operatives called upon to work on Christmas Day will be paid double time and a day off in lieu of which they will be paid wages at bare time rates. For work on Boxing Day operatives will receive either (a) Time and a half plus a day off in lieu (paid for at bare time rates), or (b) at the discretion of the employer 2½ times the bare time rate, in which case no alternative day will be given.

Reports on German Industry

Among Board of Trade reports on German industry now available from H.M. Stationery Office is B.I.O.S. 1036, "Electrostatic Cleaning of Coal: Osterfeld Colliery" (1s 6d).

Polyphase Commutator Machines

CLASSIFICATION AND ANALYSIS

IN a paper prepared by MESSRS. B. ADKINS and W. J. GIBBS (both of the British Thomson-Houston Co., Ltd.) which was read before the Utilization Section of the Institution of Electrical Engineers yesterday (Thursday), polyphase commutator machines generally are treated as a single subject.

It is shown how the different types can be classified and analysed within a common theoretical framework, the classification being made in three general groups depending on the construction of the machines, namely the shunt and series motors, the commutator frequency changer and the Scherbius machine. The second group includes the well-known Schrage variable-speed motor and the third many types of speed-regulating machines and phase advancers.

The authors describe the practical arrangement of each type of machine and the associated regulating apparatus, explaining the general effect upon performance. It is also shown that the speed/torque curve and the current locus curve tell all that it is required to know about the performance of a machine.

In the theoretical analysis an even greater unity of treatment is possible. The theory of all the important types of polyphase commutator machine can be derived from that of a slip-ring induction motor which has a slip frequency injected into the secondary windings. The vector diagrams and equations of the principal types are developed by this method, the equations checking with those obtained in other ways.

The chief differences between the three groups are brought out in the characteristics, families of speed/torque and current-locus curves being shown and compared for some of the principal types. In the opinion of the authors, this method of classifying the various machines according to their windings and the development of a common theory lead to a better understanding of their operation and of the relative merits of different machines.

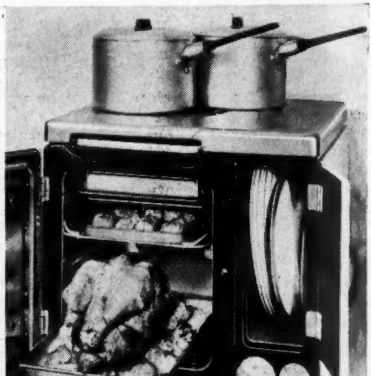
Large-Capacity Small Cooker

DEMONSTRATION IN LONDON

AT the Charing Cross Hotel on Monday last the Jackson Electric Stove Co., Ltd., arranged a demonstration for the trade and general Press of its "Giant" cooker. It was of a similar nature to demonstrations now being given in the various Electricity Areas. The aim was to show how a cooker consuming in all only 2,600 W, could provide a meal for from four to six persons. The principal feature of the appliance is the ample oven space (18¼in by 18in by 16in) which enables a 5-6 lb joint, a Yorkshire pudding and a fruit pie to be cooked at once. A loading of only 1,100 W is used in the top and bottom heating of the oven and the top element can be employed for grilling. One radiant boiling plate (7in dia., 1,500 W) is provided, but there is plenty of space for saucepans on the 18in square top.

Thermostatic control is used for the oven while the boiling plate is equipped with a "Simmerstat." At the side is a warming cupboard for plates.

The easily removable hob plate is of chromium-plated pressed steel and the oven of aluminium alloy. Finish is in cream vitreous enamel relieved in black and the oven and warming cupboard doors are fitted with spring catches and heat-resisting plastic handles. The total weight is 69 lb.



Small cooker with large capacity

Industry and the House

Views on Nationalization

By F. J. ERROLL,
M.A., A.M.I.E.E, M.P.

AS the field of nationalization extends, the House is concerning itself not only with the new measures such as the Iron and Steel Bill, but with the fate of industries already nationalized. Thus on the second reading of the Coal Industry Bill, designed to increase the number of members on the Board and give the Board additional powers, the Opposition took the opportunity of debating the whole question of the administration of the industry in the light of declining production from the mines.

They were assisted by the critical articles contributed to *The Times* last week by Sir Charles Reid, a former member of the Board and author of the Reid Report, which probably influenced more people at the General Election into favouring nationalization than anything else, and by the Conservative Party's summary of what they would do to improve the Coal Board organization published at the same time. Both advocate more decentralization and increasing the authority of the mine managers. Mr. Gaitskell made a spirited defence of the work of the National Coal Board and certainly made a good case for the present organizational structure.

Watching the B.E.A.

It is too soon to say whether the British Electricity Authority will come in for similar scrutiny and analysis. Electricity has never been so political a subject as coal, but Members' questions this week (reported on page 912) show that the House is determined to watch the progress of the generating station programme and the possible exploitation of additional sources of energy, especially when, as Mr. Harrison learnt in answer to a question, that it is still not possible to permit shop window lighting even at Christmas time. In the meantime stories of the bureaucratic nature of the British Electricity Authority continue to circulate. Members have been surprised to see a specimen of an office memorandum circulated throughout one of the new sub-areas to a list of eighteen officials in July, giving meticulous instructions regarding the way in which an index should be kept up to date.

Doubts about the way in which the existing nationalized industries are progressing were used as an argument against the nationalization of the iron and steel industry during the second reading debate. The Minister of Supply, Mr. Strauss, opened that debate with a statement that the Bill was essential if the country were to prosper and the people to have a higher and better standard of life. This belief was based, he said, not on dogma or abstract theories but on the known facts. So long as the industry remained in private hands it could not produce cheap steel in ample quantities and be responsive enough to national requirements.

"A Vast Monopoly"

The Minister at no time in his speech showed why the industry could not be efficient, but instead preferred to refer to the old days before the formation of the Iron and Steel Federation in 1934. He said that the responsible leaders of the industry themselves rejected the idea of unfettered competition, and agreed that private ownership must be tempered by State control. He accused the Steel Federation of being "a vast monopoly or cartel, possessing great powers without responsibility over the well-being of our people."

Similar arguments have been heard before on the introduction of a nationalization Bill, but the claim that the public would obtain a *cheap* service has never yet been borne out. Sir Andrew Duncan defended the low prices of British steel and showed how great the expansion of the industry had been in the past twenty-five years. He said that the Bill cut right across all the machinery, both industrial and Governmental, which had been built up in recent years for the better ordering and more efficient functioning of

all sections of the iron and steel industry. "This industry," he continued, "has afforded the most effective demonstration of the practical possibilities of effective co-operation between the Government and industry. But all that goes for nothing, and, at a time when the industry's contribution is still most vital, and when the industry is engaged in great development plans, this Bill is introduced, with all its conflict and controversy. . . . The Government make no effort to prove how efficiency is to be improved, but plunge the industry into controversy as to what happened two decades before the war. They seek not only to dispossess, but to discredit."

The "A.B.B.s" (Active Back Benchers' Committee) have been busy again, this time with a Prayer against the holding of a Census of Distribution in 1950. Trading conditions, it was asserted, will still be far from normal, with rationing, purchase tax, and food subsidies distorting normal purchasing. Traders are too busy to be harassed with further forms. In the debate which followed, the Government showed that it was determined to have a Census as soon as possible

The same Committee scrutinizes all Statutory Instruments to keep an eye on the delegated legislation which Government officials are continually issuing. It is helped by the Explanatory Notes at the end of each Order, but the one which accompanied S.I.No. 2568 entitled "The Control of Machine Tools (Electrical Equipment) (No. 4) (Revocation) Order, 1948" was far from clear: "The Order revokes the provisions prohibiting authorized electricity undertakers from refusing to supply premises using electric motors of the type described in the (No 1) Order"—published seven years ago. However, a fuller explanation (see page 913) was obtained by Sir John Mellor, a member of the Committee.

PARLIAMENTARY NEWS

By Our Special Reporter

DURING a brief debate on television in the House of Commons, Mr. J. Freeman, Parliamentary Secretary to the Ministry of Supply, said that American production figures were impressive at the moment, but there was general agreement that in quality of reception we were in no way behind the Americans. It had been pointed out that one of the principal limitations to production was the shortage of cathode-ray tubes. Some 60,000 to 70,000 bulbs and some 40,000 to 50,000 tubes were likely to be imported into this country between this autumn and next. The fact remained, however, that we had got to step up our own production of tubes considerably, and we were in process of doing so. It was likely that within about a year's time there would be sufficient cathode-ray tubes for the production of up to 300,000 receivers a year. Technical experts were divided about negative and positive modulation. Our system was positive, and the American negative, but the Postmaster-General considered that ours was the better method. He had no reason to suppose that we were in any way in danger of capitulating to the American technique in this matter.

Severn Barrage

Mrs. Middleton asked the Minister of Fuel and Power whether the inquiry by his Department into the practicability of the Severn Barrage scheme for hydro-electric production had yet been completed.

Mr. Gaitskell said that the construction of a tidal model was an essential preliminary to further consideration of this project. The construction of this model and the conduct of the necessary experiments would be under the direction of the Hydraulics Research Board. Progress had been delayed owing to the pressure of more urgent work and the difficulty of finding an appropriate site and it was unlikely that any final conclusion on this would be reached for some considerable time.

Asked if he could give any indication of the further period that would be necessary in order to get expert advice, Mr. Gaitskell said he thought it would be another two years before they could reach any final conclusion. He was afraid there was nothing further he could do to expedite the matter. The project would cost at least £60,000,000 and take eight years, and therefore they should be careful about what they were doing before they started.

Mr. Berry asked whether the Minister had taken into account world-wide experience in hydro-electricity. Quite a number of other countries had done a lot of practical work and research in this connection.

Mr. Gaitskell said he did not think that

we had any shortage of experts in this matter.

Mrs. Middleton also asked the Minister what other schemes he had under active consideration for hydro-electric production, such as those that had been proposed for the utilization of the race of the Menai Straits and of the Pentland Firth.

Mr. Gaitskell said that the merits of further tidal power schemes such as those referred to could not be determined without detailed surveys and the construction of tidal models. Owing to the shortage of skilled staff and the difficulty of finding suitable sites it would not be possible to proceed with such work until the experiments with the Severn Barrage model had been completed.

District Heating

Mr. Bossom asked the Minister of Fuel and Power if estimates were obtained to enable the 25 new generating stations which were now being built to use their waste heat for district heating; and what additional cost this would have entailed.

Mr. Gaitskell said he understood that no such estimates were obtained in connection with these generating stations the plans for which were, of course, made at least two years ago.

Mr. Bossom: "Is it not an absolute scandal, when we are investing this tremendous amount of money in the provision of 25 new generating stations, that if we had only taken the trouble to get a few estimates we could have made use of this waste heat for district heating on a wide scale in many places?"

Mr. Gaitskell said he would not agree with those facile conclusions, but if it was a scandal it was not one for which the Government had any responsibility.

Sir W. Wakefield asked what development plans now existed for furthering district heating.

Mr. Gaitskell replied that wherever a local authority wished to consider a district heating scheme in connection with the building of a new power station, the British Electricity Authority was always ready to discuss the matter. Furthermore, when discussions took place with local planning authorities about the site, the question was considered at that stage.

Shop Lighting

Mr. Gaitskell informed Mr. Harrison that he would not permit relaxation for the Christmas season of the regulations controlling shop window lighting. Asked further whether he would arrange for a modification of the shop window lighting regulations to permit the lighting of shops with arcade-like entrances, or where the windows were shaped to form a passage entrance to the shop, Mr. Gaitskell said he would not, but the regulations did not preclude the lighting of outside entrance passages where they were so dark as to make this really necessary.

Power to Refuse Supply

Sir John Mellor asked the Minister of Supply if he would explain the need for S.I. 1948, No. 2492, which was not apparent from the explanatory note.

Mr. J. Freeman said that the Electric Lighting Acts of 1882 and 1899 empowered various electricity supply companies to refuse to supply electricity to premises using certain kinds of motors. The Control of Machine Tools (Electrical Equipment) (No. 1) Order, 1941, prohibited the supply authorities from refusing to supply electricity in such circumstances. S.I. 1948, No. 2492 was issued to revoke this Order. He apologized for an error in the S.I. which had been rectified by S.I. 1948, No. 2568. The effect was to restore to the undertakings (now absorbed by the British Electricity Authority) the power to refuse to supply electricity to premises using motors of the kinds specified. There would be no adverse effect on industry, as agreement had been reached by the parties concerned on a code of practice for starting a.c. motors which had been published by the British Electrical and Allied Manufacturers' Association.

Telephones Installed

In reply to Mr. Thomas Reid, Mr. Paling, the Postmaster-General, said that 379,520 telephones were connected during 1938, bringing the total up to 3,184,000 by the end of that year. At 31st October last 4,806,000 telephones were in service, of which 554,090 were installed during the preceding twelve months.

Fuel Economy

THE "Fuel Economy Review" for 1948 (published by the Federation of British Industries at 2s 6d) includes illustrated articles on the gas turbine and steam plant in industry, steam traps, thermal insulation of industrial buildings, harnessing of free power for natural ventilation, industrial space heating, prevention of scale formation and corrosion in water-supply systems, steam raising by instrument control, mechanical coal-handling equipment and the automatic sprinkler and fire alarm system. The Review is designed to appeal to executives and the technical information is presented in a form to be easily understood by non-technical readers.

Next Week's Events

Monday, 13th December

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. Three short papers on "Machine Tool Electrification."

GLOUCESTER.—Cadena Café, 5.30 p.m. Joint meeting of I.E.E. Western Centre and the Institution of Plastics. Discussion on "Plastics Insulation," opened by N. A. Hawthorn.

LEWISHAM.—S.E. London Technical College, 8 p.m. A.S.E.E. South-east London Branch. "Voltage Control by Means of Transformers with On-load Ratio-changes," by H. Walmsley.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "The Fundamental Principles of the Sale of Electricity to Consumers," by F. Grant.

Northampton Polytechnic, E.C.1. Electrodepositors' Technical Society. "Electrodeposition in the Printing Industry," by P. B. Upton.

NEWCASTLE-ON-TYNE. — Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Lightning Protection of High-voltage Transmission and Distribution Systems," by H. M. Lacey.

Tuesday, 14th December

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "Analysis-Synthesis Telephony with special reference to the Vocoder," by R. J. Halsey and Dr. J. Swaffield.

LEEDS. — Yorkshire Electricity Board Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilization Group. "Electrical Aspects of Overhead Travelling Cranes," by G. V. Sadler.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Frequency Modulation versus Amplitude Modulation," opened by H. L. Kirke.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "The Gas Arc—A New Light Source," by J. N. Aldington.

At the Geological Society, Burlington House, Piccadilly, W.1, 5.30 p.m. Institution of Chemical Engineers. "Deposits on the External Heating Surfaces of Water-tube Boilers," by H. E. Crossley.

Kingsway Hall, W.C.2, 7.15 p.m. E.P.E.A. (London Technical Group). "High-voltage Overhead Transmission Problems," by J. S. Forrest.

LUTON.—Technical College, Park Square, 7.30 p.m. Luton Electrical Society. "A.C. and D.C. Contactors and Their Industrial Applications," by S. H. Harding.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-western Measurements Group. "An Oscillograph for Automatic Recording of Disturbances on Electric Supply Systems," by W. T. J. Atkins.

RUGBY. — Electricity Showrooms, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Design of Contactors with regard to their Industrial Application," by B. Feldbauer.

WIMBLEDON.—Compton Hall, Compton Road, 7.30 p.m. A.S.E.E. South-West London Branch. "Fluorescent Lighting," by K. R. Gibbons.

Wednesday, 15th December

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "The Lightning Strength of Power Transformers," by E. T. Norris.

BRISTOL.—Grand Hotel, 7 p.m. A.S.E.E. Bristol Branch. "The General Perspective of Electronics To-day," by J. Jackson.

EDINBURGH.—Joint meeting of the I.E.E. Scottish Centre and Edinburgh Agricultural College, 7 p.m. "The Application of Electricity to Agriculture," by C. A. Cameron Brown and E. W. Golding.

LONDON.—Charing Cross Hotel, W.C.2, 6.30 for 7 p.m., Electrodepositors' Technical Society. Informal dinner.

MAIDSTONE.—Royal Star Hotel, 7.30 p.m. A.S.E.E. Kent Branch. "Automatic Telephony," by R. D. Barber.

SHEFFIELD. — Royal Victoria Station Hotel, 6.15 p.m. I.E.E. Sheffield Sub-centre. "Behaviour of High-voltage Solid-type Cable Accessories in Service," by C. J. Armstrong and C. T. W. Sutton.

Thursday, 16th December

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Load Dispatching and the Reasons for it, with special reference to the British Grid System," by A. R. Cooper.

HEBBURN-ON-TYNE. — 6.45 p.m. I.E.E. North Eastern Students' Section. Visit to works of A. Reyrolle & Co., Ltd.

LONDON. — Caxton Hall, Westminster, S.W.1, 2.30 p.m. Diesel Engine Users' Association. "Report on Heavy-oil Engine Working Costs, 1946-47."

Friday, 17th December

LEICESTER.—College of Technology, 6.30 p.m. Joint meeting of the I.E.E. East Midland Centre and the Leicester Association of Engineers. "Modern Methods of Railway Signalling."

COMMERCE and INDUSTRY

Purchase Tax Rulings : Television Production

AFTER consultation with the Radio Communication and Electronic Engineering Association, the Commissioners of Customs and Excise have agreed that, in general, wireless receiving sets which are designed, got up and offered for sale solely for amateur or professional communication reception shall for the present be regarded as not chargeable with purchase tax under Group 18 of the tax schedule. This exclusion from tax does not apply to sets which are of the domestic or portable types used for the reception of public broadcast programmes.

In future, Christmas tree lighting sets which incorporate Group 29 (A) features, e.g., hand-painted lampshades or bulbs shaped as figures, will be liable to 100 per cent purchase tax. Other sets will bear tax at 33⅓ per cent. Parts of lighting sets supplied as separate articles but in conjunction will be taxed at the rate applicable to the complete article; otherwise (provided the parts are not decorated by hand painting and are not in the form of figures), the tax payable will be 33⅓ per cent.

New Aluminium Company

Tube Investments, Ltd., announces the formation of a new company, T.I. Aluminium, Ltd., to co-ordinate and pool the administrative, technical, research and marketing resources of the group's aluminium division. The companies involved are Reynolds Light Alloys, Ltd., with works at Redditch and Tyseley, Birmingham; Reynolds Rolling Mills, Ltd., Oldbury; and the South Wales Aluminium Co., Resolven, S. Wales. The range of products handled by T.I. Aluminium, Ltd., which commenced trading on 1st December, covers aluminium and aluminium alloy, ingot, slabs, billets, sheet, strip, tubes and extrusions. Sales and technical inquiries regarding all these products will be dealt with at the company's head offices at Redfern Road, Tyseley, Birmingham.

An Electrolux Poll

At a gathering at the Savoy Hotel, London, on 2nd December, representatives of the lay and trade press were told of a public poll which Electrolux, Ltd., is to embark upon. Following some introductory remarks by Major General Sir Harold Wernher, Bt., K.C.V.O., the chairman of the company, Mr. S. Broughton, managing director, mentioned the company's abandonment of direct sales to the public in favour of trade channels in the sale of its suction cleaner. He explained that the aim of the poll was to ascertain the order of importance of the various features of the machine to assist the company in its market research. Mr. H. M. Smith then gave an entertaining demonstration of the twelve points which will form the subject of the poll.

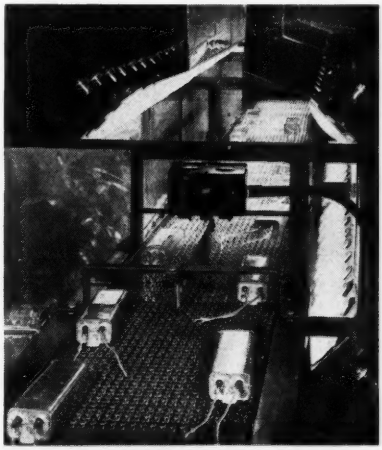
Three Electrolux refrigerators will be presented to the successful entrants and there are ten consolation prizes of £5 each. Electrolux dealers, who have to certify the cards, will also be eligible for special prizes for window displays, etc.

Electrical Wholesalers' Dinner

The annual dinner of the Electrical Wholesalers' Federation will be held on 24th March next at the Savoy Hotel, London.

Testing Capacitors

An infra-red oven has recently been installed in the B.T.H. works at Coventry where it is employed for the detection of leakages in newly manufactured capacitors.



Capacitors passing through "Mazda" infra-red oven during test for leakages

This "Mazda" oven is constructed along the usual lines, the lamps and polished aluminium ventilation control panels being housed within an enclosure of aluminium sheeting on an angle-iron framework. There

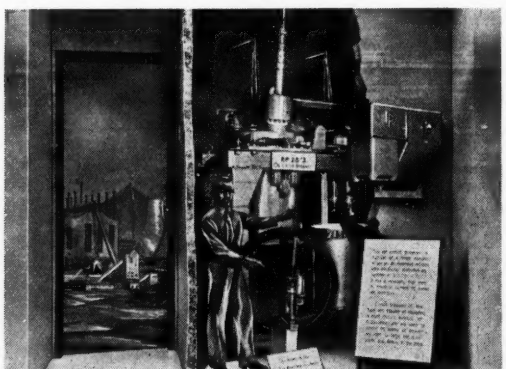
are altogether seventy-two lamps mounted in four rows, two rows on each side of the oven. The capacitors are first placed in a de-greasing bath so as to ensure that the outer casings are completely free from any traces of the petroleum jelly with which they are filled. A wire-mesh conveyor belt then carries them in two rows at a speed of 18 in. per minute, into the oven where they are subjected to a moderate heat. While passing through the oven the petroleum jelly is melted and if leaks occur in the capacitor casings they are indicated by the presence of grease. On leaving the oven, the capacitors are conveyed to the examiners who repair any faults. The electrical circuit of the infra-red lamps is wired in conjunction with the circuit controlling the conveyor belt so that should the belt stop the lamps will be automatically switched off, thus avoiding over-heating of the capacitors still in the oven.

Britannia Batteries, Ltd.

Britannia Batteries, Ltd., announces that for purely internal reasons it is being wound up voluntarily by its members, but another company will almost immediately be trading under the same name. During the interim period correspondence will refer to the liquidator and will be signed for him. This will not affect customers, trading policy, or products in any way, and the present executives will remain.

Ferguson Pailin Window Display

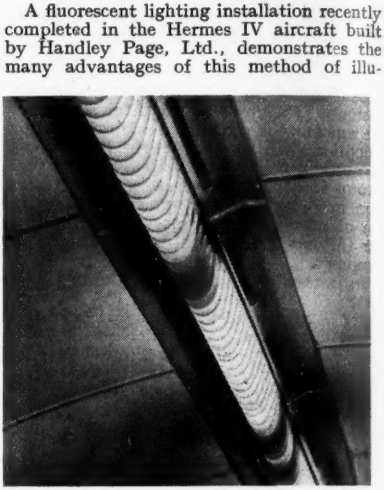
The accompanying picture of a window display in Crown House, Aldwych, London, W.C.2, arranged by Ferguson, Pailin, Ltd., shows an oil circuit breaker typical of a large number in use on a 40-kV distribution system in South Africa. It has a specially high level of insulation to meet the onerous site conditions.



An oil circuit breaker window display

Fluorescent Lighting in Aircraft

A fluorescent lighting installation recently completed in the Hermes IV aircraft built by Handley Page, Ltd., demonstrates the many advantages of this method of illumination. It was planned by lighting engineers of the British Thomson-Houston Co., Ltd., who also supplied the equipment.



B.T.H. Fluorescent lighting in an aircraft

The main saloon of the aircraft is illuminated by 24 Mazda 20-W "warm-white" lamps arranged in a continuous row along the centre line. The reflector, on the back of which the lampholders and auxiliary gear are mounted, constitutes the cover plate into which extraction grilles have been pierced to form part of the air conditioning system. For emergency purposes, tungsten lighting has also been incorporated in the circuit. Several 15-W tungsten lamps have been installed in the toilets and dressing rooms, mounted in special ceiling or mirror fittings, and similar lighting has been employed in the freight compartment. The bulkhead fittings are equipped with wire guards to prevent accidental breakage. The supply is 110-120V d.c. In future aircraft of this design the freight compartment lighting will operate on a 24V d.c. supply.

Television Receiver Output

Britain produced 12,037 television receivers in October, 1948, and 11,854 in September, according to figures issued by the Radio Industry Council, as compared with 6,303 in August last and 3,534 in July. The average monthly rate of production in 1948 has been 6,430 as compared with 2,300 in 1947 and 800 in 1946. The November figures are not yet available, but it is known that total production since the recommencement of manufacture in May, 1946, has now exceeded 100,000 sets. Sales have closely followed production.

Dunfermline Service Centre

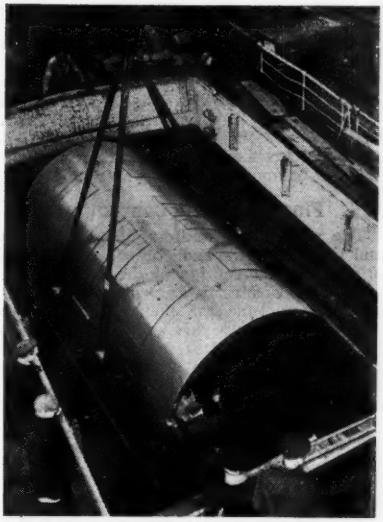
A new Service Centre for the Fife Sub-Area of the South East Scotland Electricity Board was opened by Provost J. S. Gellatly in Dunfermline on 30th November. Mr. W. S. Sawtell, deputy chairman of the Board, thanked the Provost and presented the Lady Provost with an electric clock as a souvenir of the occasion. Following the opening ceremony there was a demonstration, "The Magic of the Lamp," by Mr. T. S. Gavin of the British Thomson-Houston Co., Ltd., and the two E.D.A. films, "Prelude to Prosperity" and "The Electric Cooker" were shown. The Service Centre will display set pieces from time to time showing how electricity can be used in the home, factory and on the farm, and it will cater for a population of 61,000.

Beryllium Fatality

The first death to occur in this country from beryllium compound poisoning was the subject of an inquest on 4th December on Jack Palmer (aged thirty-six), a physicist, of Crouch End. Evidence was given that Palmer had been employed in the development of fluorescent tubes since January, 1941, and from December, 1941, to December, 1942, he was working on materials containing beryllium oxide. He remained apparently well until 1945. Dr. A. Strange said that other materials had been developed for use in manufacturing fluorescent lamps. The main difficulty was to get a material as efficient. A verdict of "Death by Misadventure" was returned.

Large Stator for Belfast

In the accompanying illustration we show the 80-ton stator of a Metrovick turbo-generator being slung to the S.S. *Ulster Merchant*. The generating set, which is for the Belfast Corporation, is rated at 30,000 kW, 22 kV, 3,000 r.p.m. It is the sixth set that the Metropolitan-Vickers Electrical Co., Ltd., has supplied to Belfast but the first to generate at 33 kV. The Belfast Corporation power station is independent of the North of Ireland Electricity



Shipping an 80-ton stator to Belfast.

Board's station at Ballylumford, but it may supply power to the Northern Ireland grid lines, which operate at 33 kV.

E.A.W. Conference

The E.A.W. Annual Conference of the Electrical Association for Women will take place on 29th April, 1949, at the Connaught Rooms, London, W.C.2. The annual general meeting will be followed by a luncheon.

Transformer Supplies in Australia

The transformer supply position in Australia and particularly in Sydney, is referred to in a recent issue of the *Electrical Engineer and Merchandiser* (Melbourne). A survey by the Electricity Supply Association showed that transformers with an aggregate capacity of 330,000 kVA were received from Australian manufacturers during 1946-47 against average annual requirements for five years of 890,000 kVA, and orders outstanding at the end of 1947 totalled 1,050,000 kVA.

In the case of the Sydney County Council, a review of the Council's requirements and the delivery dates promised on orders placed last year with local manufacturers indicated that only some 30 per cent of needs for distribution transformers would be met in the time required. In view of the difficulties in local production the general manager (Mr.

G. S. Boyd) recommended the Council to purchase up to fifty 500-kVA transformers from the English Electric Co., Ltd., at a maximum estimated cost of £50,150 to £51,550, inclusive of duty at 22½ per cent, f.o.b. The duty varies from £165 to £172 which, in view of the circumstances, may possibly be remitted, thus reducing the cost per unit to from £838 to £859, as compared with £660 for an Australian transformer. Delivery of the initial consignment is scheduled for five to six months ex works and the balance in eight to nine months.

Final I.M.E.A. Convention

The presidential address, the two papers and discussions, and other proceedings at the final Convention of the Incorporated Municipal Electrical Association at Eastbourne last June are now available in a bound volume (pp. lxiv+169 and inset diagrams). A full list of delegates is also included. Copies (13s, including postage) may be obtained from Mr. J. W. Simpson, the former secretary of the I.M.E.A., at 16, Stratford Place, London, W.1.

City and Guilds Examinations

Entries for the following 1949 City and Guilds examinations should be made not later than 1st March:—Subject 50, Telecommunications Engineering; Subject 53, Radio Service Work, Intermediate; Subject 54, Radio Amateurs' Examination. For Subject 53, Radio Servicing Certificate Examination (Final), applications on special entry form should be sent to the Secretary, Radio Trades Examination Board, 9, Bedford Square, London, W.C.1, by 1st February. The dates stated relate only to candidates in Great Britain and Ireland.

Conspiracy Charge

The hearing was resumed at Wimbledon on 3rd December of a case in which Harry Tauber, Glasgow, manufacturer's agent, Barnet L. Wein, Glasgow, and Ralph Lewis, Kensington, were jointly charged with fraudulently conspiring to defraud the Eralite Manufacturing Co., Wimbledon, of goods to the total value of £10,000. It was alleged by the prosecution that goods were supplied to a firm in Shaftesbury Avenue, London, and another in Glasgow to the extent of £3,500 in one instance and £6,500 in the other on the instructions of Lewis. Mr. M. Crump, for the prosecution, said both these firms were non-existent, and the Eralite Co. had not received a penny from either transaction.

At the previous hearing on 12th November no evidence was offered against Robert B. Jones, Glasgow, also charged with conspiracy, and he was discharged.

W. C. Routs, Tottenham, said at the resumed hearing that Lewis had previously told him that he had got a big order from a firm in Glasgow and was expecting another. Samuel Wolfe Cohen, managing director of W. and S. Cohen, Ltd., wholesale electrical distributors, Glasgow, said that Tauber introduced him to Wein in the name of King. Wein said he had 1,000 electrical articles, including heaters and kettles made by the Eralite Co., which he wanted to dispose of for £1,500. He introduced Tauber and Wein to a man named Merrens with whom Cohen was associated in another company, and recommended Merrens to buy the goods for £1,000. This was done and he paid Tauber £50 commission for introducing Wein. In cross-examination Cohen said the transaction was a joint venture between Merrens and himself. It would have cost about £2,000, excluding purchase tax, to buy the goods from the Eralite Co.

The case was adjourned until 20th December.

Diesel-Electric Locomotives for Ceylon

The North British Locomotive Co., Ltd., in association with the General Electric Co., Ltd., as supplier of the electrical equipment, has received an order for eight 625-h.p. diesel-electric shunting locomotives for the Ceylon Government Railway. The locomotives have single cabs and are carried on two four-wheel bogies, with all axles motored. Maximum tractive effort is 35,000 lb at up to 4 m.p.h. The power unit consists of a Paxman "12 R.P.H." turbo-charged diesel engine driving main and auxiliary generators. The locomotives are designed principally for operating in the Colombo goods yard, but may also be required to work on the Kolonnawa branch line. They are to be capable of working continuously for six days.

Protective Plastic Coating

A plastic composition specially designed as a protective coating for delicate metallic articles and components is now being made under the proprietary name of "Avigel" by Clear Glass Products, Ltd., 16-18, Malvern Road, Southampton, Hants. It is used by dipping, thus forming a tough resilient coating which can be readily stripped from the object covered. It is transparent and is available in several colours.

Radio Production in South Africa

Plans for the co-operation of several British firms of radio manufacturers with established South African concerns in the construction of a factory to produce a cheap type of battery radio set for the native population may be discontinued as

a result of the recently-introduced Union import regulations, according to reports in Cape Town. Representatives of the patent holders in Britain have suspended negotiations pending the determination of the Union Government's attitude on imports of parts, machinery and skilled technicians. According to reports, an unfavourable reply from the Union Government is likely to result in the negotiations being dropped and a new factory for the production of the radio sets being established in Rhodesia. This would mean that the Union would lose an export market of up to one million sets a year besides a local market for many thousands of receivers.—*Reuter.*

Trade Announcements

Arcolectric (Switches), Ltd., has just completed an extension to its factory at West Molesey. The new building is of modern construction and has a floor area of approximately 4,740 sq ft. This brings the total floor area available for production to 8,740 sq ft. This new factory space will be devoted to large-scale production of a wide range of small switches for industrial equipment and domestic appliances.

A. H. Hunt, Ltd., Bendon Valley, Garratt Lane, Wandsworth, S.W.18, in agreement with the Mycalex Co., Ltd., have taken over the world selling rights for the product now to be known as the "Hunt-Ingram" capacitor. This was previously known on the market as the "Mycalex" capacitor. All inquiries for these capacitors should now be addressed to A. H. Hunt, Ltd.

The Applied Heat Co., Ltd., has removed to Elecfurn Works, Watford By-Pass, Watford, Herts (telephone: Watford 6094), and the manufacture of "Grafton" electric pottery kilns and glass lehrs has been transferred from Barnes to this address.

The Telegraph Condenser Co., Ltd., has acquired the premises of S. G. Brown, Ltd., adjacent to its own factory and headquarters at North Acton. The additional space will be used for an extension of condenser development and research work.

Trade Publications

Clear Glass Products, Ltd., 16-18, Malvern Road, Southampton.—Priced folder describing "Avigel," a protective coating for metallic articles and components.

George Cohen & Co., Ltd., Wood Lane, London, W.12.—Illustrated folder on the "Coborn" 50-ton hydraulic press for plastic or rubber moulding.

A. E. Cawkell, 7, Victory Arcade, The Broadway, Southall, Middlesex. — Priced folder describing a comparator type of noise measuring instrument.

Air Conditioning & Engineering (N.I.), Ltd., 3, Bayley Street, Tottenham Court Road, London, W.C.1.—Priced leaflet on an industrial unit heater.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—Folder No. 9004A illustrating temperature measuring instruments.

Trade Marks

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month from 1st December:—

DOLPHIN (design). No. B661,871. Class 7. Electric scaling machines.—Electric Scaling Hammers, Ltd., Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1.

MEM-AC. No. 663,322. Class 9. Electrical apparatus and instruments included in Class 9.—Midland Electric Manufacturing Co., Ltd., Reddings Lane, Tyseley, Birmingham, 11.

DENGLOW. No. 663,566. Class 9. Electrical apparatus for use in the starting and controlling of electric lighting apparatus, and electric switches, bulbs, and electric discharge tubes, all being part of such apparatus.—F. G. Dennis, trading as Denco Signs, Wangey Road, Chadwell Heath, Essex.

KEMET. No. 664,296. Class 9. Wire specially adapted for use in electronic apparatus and as electrodes.—Kemet Laboratories, Inc., New York. Address for service, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

TELINDUCT. No. 664,844. Class 9. Electrically operated measuring apparatus, recording meters, electrically operated controlling apparatus included in Class 9 for heating installations, and checking (supervision) apparatus, indicating apparatus for inspectional control, coin-freed apparatus and calculating machines.—Landis & Gyr A.G., Switzerland. Address for service, c/o D. Young & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

INSECT-A-LITE (design). No. 662,266. Class 11. Electric incandescent lamps.—Verd-a-Ray Corporation, Toledo, Ohio. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

PONY. No. 660,036. Class 12. Electrically-propelled vehicles.—Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.

Information Department

The extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

MOTORIZED DOOR OPENING EQUIPMENT

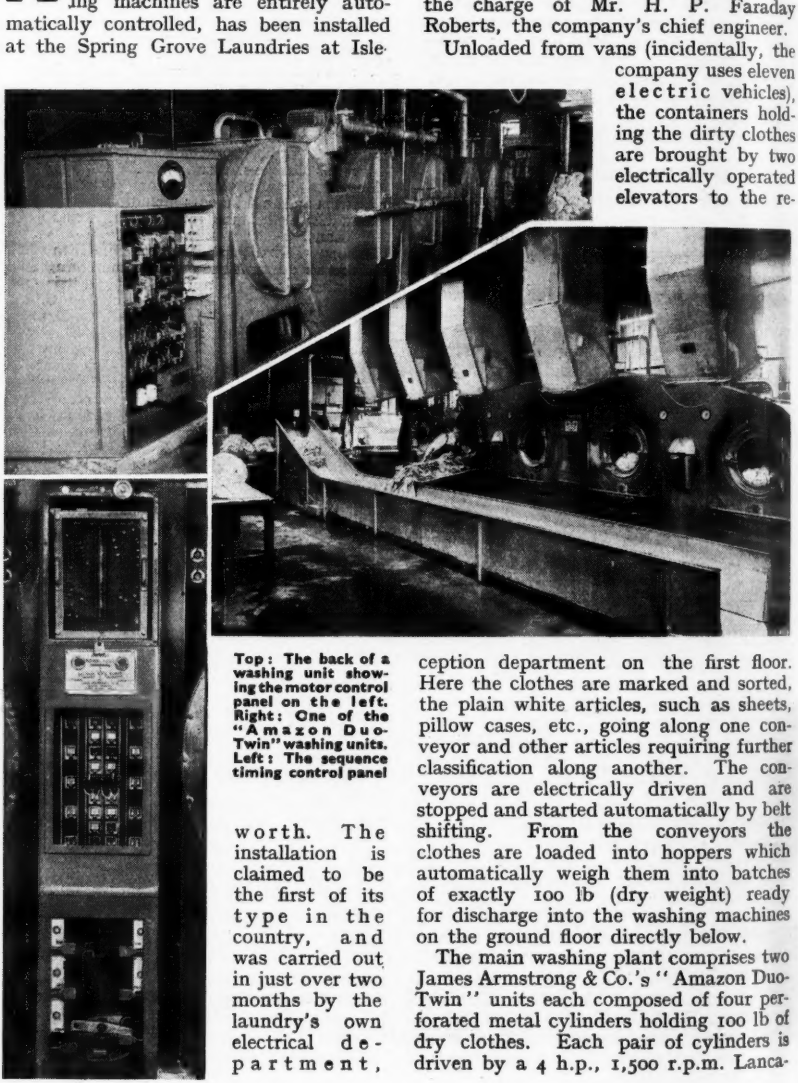
General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Electric Laundry

AUTOMATIC CONTROL OF WASHING MACHINES

A COMPLETE new electrically driven plant, in which the washing machines are entirely automatically controlled, has been installed at the Spring Grove Laundries at Isleworth. The installation is claimed to be the first of its type in the country, and was carried out in just over two months by the laundry's own electrical department, which supervises also the electrical plants at six associated laundries and is under the charge of Mr. H. P. Faraday Roberts, the company's chief engineer.

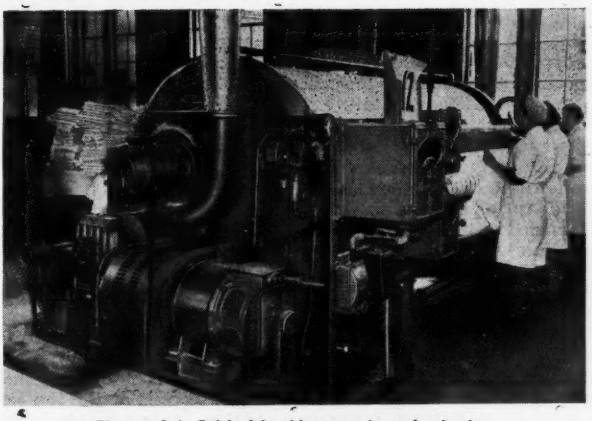
Unloaded from vans (incidentally, the company uses eleven electric vehicles), the containers holding the dirty clothes are brought by two electrically operated elevators to the reception department on the first floor. Here the clothes are marked and sorted, the plain white articles, such as sheets, pillow cases, etc., going along one conveyor and other articles requiring further classification along another. The conveyors are electrically driven and are stopped and started automatically by belt shifting. From the conveyors the clothes are loaded into hoppers which automatically weigh them into batches of exactly 100 lb (dry weight) ready for discharge into the washing machines on the ground floor directly below.



Top: The back of a washing unit showing the motor control panel on the left. Right: One of the "Amazon Duo-Twin" washing units. Left: The sequence timing control panel

The main washing plant comprises two James Armstrong & Co.'s "Amazon Duo-Twin" units each composed of four perforated metal cylinders holding 100 lb of dry clothes. Each pair of cylinders is driven by a 4 h.p., 1,500 r.p.m. Lanca-

shire Dynamo & Crypto motor, but all four cylinders of each unit are controlled as one machine. When the machines have been loaded, all the operator has to do is to press a button on a Newbery control panel and the whole cycle of operations, lasting about an hour and covering the admission of steam, hot and cold water, soap, soda, bleach and blue, and the washing and rinsing, is carried out without further attention. Bells and colour lights indicate the various stages as they are reached, and when all operations have been completed the machine switches itself off.



Flat work is finished in this steam-heated calender

Any desired sequence of operations can be readily obtained simply by altering the position of plugs on a small panel or grid, which can if desired be removed bodily and replaced by another already set up to a different formula. These sequence control panels can actually be regarded as graphs of the processes, the vertical component representing the different materials employed and the horizontal component the time factor.

By inserting plugs into the holes provided on the panels any material can be added or any process (washing, rinsing or emptying) can be carried out at any desired time, constantly moving wipers on a continuous chain (driven by a fractional h.p. Klaxon motor) making contact with spring-loaded plungers at the back of the panel and operating valves through Bowden cables. A float arrangement in conjunction with a series of flaps and mercury switches ensures that, irrespective of the time factor, the correct volume of the required material is admitted. At the end of operations a special delay mechanism obviates possible damage through overload resulting from all the valves operating simultaneously. Manual control of the machines is provided for and valves enable either half of the machine to be isolated from the other.

The sequence timing control is operated by 40 V d.c. The motors, which run on 480 V d.c., are normally controlled by 40 V d.c. through latched-in relays, but can be operated manually. The washing cylinders, which are driven through Croft reduction gearing, are arranged for six reversals a minute, dynamic braking of the motors being provided. For con-

Leaving the washers the work is spun-dried in hydro-extractors

trolling the motor operation a "Dupar" panel has been supplied by Dewhurst & Partners, Ltd. For articles requiring special treatment there are several manually controlled separate "Amazon" units, some of them equipped with dual-speed motors. Soap and soda are mixed in solution in tanks and circulated to the various washing machines by pumps.

The washing operations completed, the glass doors of the cylinders are opened and the work is transferred to two conveyors (A. & C. Jenner) which carry it to four 36 in diameter hydros (9.5/2.5 h.p. L.D.C. motors), two for each "duo-Twin" unit.

Eventually shaker-tumblers will be installed to get the clothes out of the compressed state which they inevitably assume during their treatment in the hydros. Until suitable machines are obtainable, however, the work is taken from the hydros on trolleys, the flat work to a 120 in long, 54 in diameter, steam-heated calender; towels, etc., to drying tumblers; and the remaining articles to various types of pneumatically operated steam-heated presses.

The flat-work ironer, which operates at 50-65 ft per min., is driven by an 11 h.p. 480 V L.D.C. motor through a David Brown "Radicon" reduction gear, a fluid coupling providing for variation of speed. Brookhirst control gear is provided and there is magnetic braking operated by the finger guard. The perforated hollow cylinder has a 2 h.p. motor at each end driving centrifugal fans drawing out the steam. The all-steel bed, which is formed of angle irons going into headers at each end, is itself raised and lowered by hydraulic rams to give the desired pressure.

The drying tumblers, which are very similar in appearance to the washing machine units, incorporate steam-heated coils at the top and fans at the bottom. Hot air, regulated by baffles, is drawn through the clothes contained in the rotating perforated cylinders, which are driven by ½ h.p. motors.

Most of the electricity requirements of the laundry are met by a 60 kW Belliss & Morcom generating plant operated by steam which is afterwards used for all washroom purposes and space heating.

E.R.A. Publications

THE undermentioned technical reports have been issued by the British Electrical and Allied Industries Research Association at the net prices stated in each case:—

G/T220 "Gas Blast Circuit Breakers. Preliminary Study of Aerodynamic Conditions near the Nozzle Contact." By A. A. Hudson. 12s (illus.). Preliminary results of an aerodynamical investigation at no load and with arcing for a parallel bore contact of 1¼in diameter and a convergent-divergent contact of 1in diameter throat section. From measurements of variation of total pressure and static pressure, along axis of the nozzle, with no arc present, the velocity variation along the axis was deduced for the convergent-divergent throat.

G/T223 "German High-Voltage Circuit-Breaker Design—Summary of Dimensional Data from B.I.O.S. and other Sources." By J. W. Dalton. 6s. Dimensions and other particulars of circuit breakers with oil-immersed and water-immersed contacts and of air-blast and hard-gas types at voltages between 6 and 220 kV. Information is given regarding the highest MVA rating in production near the end of the war.

O/T3 "The Effect of Electrolysis upon the Strength of Reinforced Concrete." By G. Mole. 6s (illus.). Continuation of work on electrolysis in concrete reported in Ref. O/T2 confirms and extends the data on d.c. electrolysis and a study of the effect of a.c. electrolysis; a method of correlating bond strength with setting by chemical analysis of the concrete is given.

Switchboard Operator's Death

ONE of the three men recently injured at Kirkstall power station, Leeds, William Westerham (47), a switchboard operator, died later in Leeds Infirmary. At the inquest a verdict of "Accidental death resulting from toxæmia following electrical burns" was recorded. Mr. D. Hudson said that he was asked by Divisional Control to isolate certain switches and as he was disengaging a switch there was a "colossal arc" and an explosion. Westerham caught the full force of it and was thrown to his knees. Mr. H. E. Vickers, generating engineer, stated that some fault developed in the switchgear. He did not think the weather had anything to do with it, neither was it the fault of any person.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

Drake & Gorham, Ltd., report a trading profit for the year ended 30th June last of £17,346, as compared with £9,005 for the preceding year, plus rents received £2,835, investment income, etc., £262, and dividend from subsidiary £12,636, making £33,079 (against £28,042). After providing for depreciation, taxation, etc., there is a net profit of £14,676 (£5,475). The ordinary dividend for the year is maintained at 5 per cent, and £36,692 is carried forward (against £31,297 brought in).

Vactric, Ltd., has announced that the dividend on the 6 per cent cumulative preference shares due on 1st December will not be paid. A similar announcement was made in respect of the preference payment due on 1st June last. The last ordinary distribution was 22½ per cent, less tax, for the year ended 30th September, 1945.

British Rola, Ltd., has announced that the dividend on the 6½ per cent preference due on 30th December will not be paid. The payment due on 30th June last was also passed. The last ordinary dividend was 10 per cent, less tax, for 1946-47.

Lightfoot Refrigeration, Ltd., has declared an interim dividend of 3 per cent.

The East African Power & Lighting Co., Ltd., has declared an interim dividend of 3 per cent (unchanged).

Vent-Axia, Ltd., recommends an interim dividend of 100 per cent, less tax.

The Globe Telegraph & Trust Co., Ltd., is again paying an interim dividend of 1 per cent, tax free.

The Sun Electrical Co., Ltd., is maintaining its dividend for the year at 7½ per cent.

New Companies

L. C. Hatt, Ltd. — Registered 24th November. Capital £6,000. Electrical engineers, etc. Directors: F. Dook, 37, Cross Street, Manchester, and Mrs. Gladys F. Hatt, 67, Banbury Road, Oxford. Secretary: F. Dook. Regd. office: 67, Banbury Road, Oxford.

Moffats Overseas, Ltd.—Registered 25th November. Capital, £10,000. Exporters, importers and manufacturers of and dealers in electrical cooking apparatus, electrical domestic apparatus, etc. Secretary: L. R. Pincott. Regd. office: Northgate House, 1, Copthall Close, Moorgate, E.C.2.

Bennie Electrical, Ltd.—Registered 25th November. Capital, £100. Permanent directors: F. H. Biddle, F. D. Biddle and A. Uvary (all directors are directors of Bennie Lifts, Ltd.). Secretary: F. D. Biddle. Regd. office: 2, Tinworth Street, S.E.11.

Bennie Metal Products, Ltd.—Registered 25th November. Capital £100. Directors and other particulars similar to Bennie Electrical, Ltd.

Machine Rentals, Ltd.—Registered 23rd November. Capital £2,000. To carry on the business of hiring, leasing and supplying automatic domestic machinery and appliances, electrical engineers and general electrical installation contractors, etc. Directors: I. E. B. Skimming, Taplow House, Taplow, Bucks; C. S. Scott, 8a, Dilke Street, Chelsea, S.W.; and R. J. Tombling, 9b, Upper Hill Flats, Kingsbury, Middlesex. Secretary: C. S. Scott. Regd. office: 1/2, Great Winchester Street, E.C.2.

Radio and Electrical Supplies (Broadstone), Ltd.—Registered 18th November. Capital £5,000. Director and secretary: G. M. Hart. Regd. office: Wimborne House, Richmond Hill, Bournemouth.

J. H. Duerden, Ltd.—Registered 15th November. Capital, £2,000. To acquire the business of an electrical factor carried on by J. H. Duerden at Nelson. Directors: J. H. Duerden (permanent), Mrs. N. Duerden and J. C. Duerden, all of 155, Halifax Road, Nelson. Secretary: W. Croasdale, Regd. office: Queen's Depot, Peter Street, Nelson.

Panks (Castle Hill), Ltd.—Registered 2nd November. Capital, £5,000. Electricians, radio and electrical engineers, etc. Directors: H. A. Pank and Mrs. Eva M. Pank, J. C. Pank, C. C. Pank and Mrs. Marjorie E. Pank. Regd. office: Castle Market, Norwich.

Edgworth Electrics, Ltd.—Registered 2nd November. Capital, £5,000. Directors: F. R. Brice and S. J. Phillips. Regd. office: 98, London Road, St. Albans, Herts.

Multisonic Controls, Ltd. — Registered 26th November. Capital, £15,000. To acquire the business of internal microtelephone system and service carried on by T. W. Hannen and L. A. S. Hall, at Castletown, Portland, Dorset, and elsewhere, as "Southern Telephone Facilities." T. W. Hannen and L. A. S. Hall are permanent joint managing directors. Secretary: L. A. S. Hall. Regd. office: Tower House, Carfax, Oxford.

Bede Transformer Co., Ltd.—Registered 25th November. Capital, £2,000. Electri-

cal, mechanical, marine, constructional, internal combustion and general engineers, manufacturers of and dealers in electrical switchgear, motors, dynamos, etc. Directors: J. R. Brown, Mrs. Winifred Brown and G. R. Downey. Secretary: Mrs. W. Brown. Regd. office: Bedesway, Bede Trading Estate, Jarrow-on-Tyne.

Kingsbury Fitch & Co., Ltd.—Registered 27th November. Capital, £100. Manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus and accessories, radio sets and valves, etc. First directors: C. K. Fitch, Doris E. Fitch, H. S. Denne and Adeline F. Denne (secretary. Regd. office: 54, Braundton Avenue, Sidcup, Kent.

Multiple Facilities, Ltd.—Registered 27th November. Capital, £100. Manufacturers of and dealers in radio, dynamos, refrigerators, cookers, lamps, etc. A. Landau (director Brookers Lighting & Radio, Ltd., and Spartan Radio & Electric Ltd.), is the first director. Secretary: S. Featherman. Regd. office: 71, Bishopsgate, E.C.2.

Telekay, Ltd.—Registered 30th November. Capital, £1,000. Manufacturers, importers and exporters of and dealers in radio, television and other electrical goods, etc. Directors: H. Kay and Ernest Gross, both of 13, Marylebone High Street, W.1.

Increases of Capital

Davey, Paxman & Co., Ltd.—Increased by £350,000, in £1 4½ per cent redeemable cumulative preference shares, beyond the registered capital of £350,000. On 6th August, 1948, Ruston & Hornsby, Ltd., of Lincoln, held 349,200 shares.

C. Lewery & Co., Ltd.—Increased by £200, in £1 ordinary shares, beyond the registered capital of £210.

D.C. Engineering Co., Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £50,000.

H. C. Wall & Co., Ltd.—Increased by £3,000, in £2,500 ordinary and 500 6 per cent cumulative preference shares of £1 each, beyond the registered capital of £2,500.

Autricity, Ltd.—Increased by £4,900, in £1 ordinary shares, beyond the registered capital of £100.

Mawdsley's, Ltd. — Increased by £100,000, in £1 ordinary shares, beyond the registered capital of £150,000. On 26th April, 1948, the Southern Areas Electric Corporation, Ltd., held 99,485 shares; a further 25,000 were allotted on 25th June, 1948, and a further 25,000 on 5th November, 1948.

C. A. Sothers, Ltd.—Increased by £5,000, in £1 6 per cent cumulative preference shares, beyond the registered capital of £2,500.

Baghdad Light & Power Co., Ltd.—Increased by £400,000, in £1 unclassified shares, beyond the registered capital of £800,000.

A.I. Electric Welding Machines, Ltd.—Increased by £9,000 in £1 ordinary shares beyond the registered capital of £1,000.

Bankruptcies

O. P. Lowther, formerly of 27, Beaufort Mansions, Beaufort Street, London, S.W.3, electrical engineer, and lately residing at 103, Hawkins House, Dolphin Square, London, S.W.1.—Trustee, Mr. T. J. M. Mcleod, 4, Bucklersbury, London, E.C.4, released 18th November, 1948.

H. J. Keene, trading as Bush Tool & Supply, 38, Fairlawn Avenue, Chiswick, London, W.4, and carrying on business at 33, Park Road, North Acton, W.3, electrical manufacturer.—Trustee, Mr. J. M. Clarke, 20, Eaton Place, London, S.W.1, Official Receiver, released 13th November, 1948.

W. E. Williams, 5B, Winchester Street, Salisbury, electrical and radio engineer.—First and final dividend of 6s 2½d in the £, payable 14th December at the Official Receiver's office, 52, Fisherton Street, Salisbury.

E. N. Belsten, residing and carrying on business at 245, Highters Heath Lane, Warstock, Birmingham, electrical contractor.—Receiving order dated 7th March, 1940, rescinded and order of adjudication dated 7th March, 1940, annulled on 22nd November, 1948, the Court being satisfied that the costs, fees, charges and expenses of the bankruptcy, and the debts of the debtor, together with 4 per cent statutory interest, have been, or will be, paid in full.

Reyrolle Inquiry

ON a motion by Equatorial Trust, Ltd., a shareholder in A. Reyrolle & Co., Ltd., Mr. Justice Vaisey on 6th December made an order for an investigation by an inspector of the Board of Trade into the affairs of A. Reyrolle & Co., Ltd.

Mr. M. L. Gedge, for the company, said that serious allegations had been made to which there was a good reply, but the company felt that the whole matter should be thrashed out before an inspector. The company was prepared to consent to the order.

Mr. Milner Holland, K.C. for the Equatorial Trust, Ltd., said that he was not seeking the inquiry because anything had been done wrong by the company. The complaint was on the ground of alleged misfeasance by a director.

STOCKS and SHARES

STOCK EXCHANGE markets and prices have turned dull. In explanation of this reactionary tendency, various reasons are advanced. Amongst them the most probable would seem to be the recognition of the need for obtaining cash against the claims of the forthcoming capital levy, due on 1st January. To some extent, provision for this has been made in advance, but in a good many cases those liable have postponed their preparations. Some of the present selling is known to be for account of people who come into the "special contribution" class. The dullness has affected most sections, including the gilt-edged market, where Transport Threes have gone back to 99½, and Electricity Threes to 102½. The partly paid scrip of the latter is quoted at 1⅜ premium above the paid-up value of £35 per cent.

Cable Stocks and Shares

The Cable & Wireless Tribunal will not meet until 12th January and, in advance of this, prices of the stocks have been dwindling. At the present 207 the yield on the ordinary is, of course, negligible: a shilling or two under 2 per cent, to be exact, on the basis of the 4 per cent dividend, which the stock has been receiving. This week's fall is 6½ points: the preference at 122½ is 4 down. Globe Telegraph & Trust, on offer at 50s, give a gross yield of £3 12s 9d. Marconi Marine at 31s are a little lower on the week.

Changes on the Week

Joseph Lucas shares stand out with a rise of 2s 6d to 87s 6d. Investment favours the shares for the reasons set out here on 5th November, when some attention was given to the profits, and to the impressive balance-sheet last issued by the company. Aberdare Cables shares are quoted ex rights to the new issue, one new share for every seven old being given at 50s per share. The price of the senior issue is unchanged at 65s. The new are changing hands on the basis of 16s 3d premium. Tube Investments at 6½ are down 1/16; Tillings at 121s are 1s easier. Declines of 6d occurred in British Insulated Callenders, 36s, Siemens, 35s 6d, and Decca, 22s. Scophony, from their recent 1s 6d, have risen to 2s 3d on buying which is reported to emanate from the United States.

E. K. Cole Dividends

"Ekco's" financial year ended in September. Last year the company reduced the interim dividend from 8 to 6 per cent: the final is due at about the turn of the year. The current year's results from other companies in this field have made too mixed a showing to be of reliable guidance to the coming E. K. Cole report. Good figures from E.M.I. and Pye, for instance, have contrasted with bleak reports from others with radio interests. Since the latter are combined, in the case of most manufacturers with a variety of allied activities, conclusions are the harder to draw. "Ekco" 5s shares at 15s 6d are about mid-way between this year's high and low. For 1947, the total dividend was 22½ per cent.

Vactric Anomaly

Last week's passing of the dividend, as anticipated, on Vactric £1 preference shares drew attention to the staring anomaly between quotations for these and for the ordinary. The preference stand 5s below their par value; the 5s ordinary command a price of 13s 9d, which compares with a figure of rather less than 5s at the time of the Treasury Loan of £500,000 granted last August. Since the bulk of profits must go during the next five years towards loan interest and repayments, and since no ordinary dividend may be paid without Treasury consent, the price of the ordinary does not appear to bear logical relation to medium-term dividend prospects. It can, in any case, scarcely be squared with a figure of 15s for the £1 preference. By way of explanation, the market refers to possible American interest in the shares. Rumour has it that Vactric may come to an agreement with the American Coca Cola Company for supply of bottles to the latter.

Lines on Offer

Among preference shares available in fair numbers are the 4½ per cent issues of Scottish Cable at 23s 6d, yielding £3 16s 6d per cent, and Sterling Cables at 20s 6d, yielding £4 8s 4d per cent. Hackbridge Cable "fives" at 24s 9d pay just over 4 per cent. Aberdare Cables of South Africa 5½ per cent preference can be bought at 26s 6d, to yield £4 3s per cent. On the established market favourites in this category the return is now little better than 3½ per cent. In the equity lists is a line of Allen West 5s ordinary on offer at 11s 4½d, paying £4 8s per cent on the conservative 10 per cent dividend. Laurence, Scotts at 15s 6d, English Electric at 50s and Enfields at 37s are all available on a 4 per cent return basis.

Scophony

In last week's rates a reference to Scophony, Ltd., fell under the heading "Radio and Television Trust." The company asks us to point out that it is in no way connected with the Trust.

Electricity Supply

Further Scottish Extensions : North Wales Survey

Argyll. — DISTRIBUTION EXTENSIONS.—The North of Scotland Hydro-Electric Board has approved plans for extending supplies of electricity in an area stretching 90 miles from Southend, Mull of Kintyre, to Inveraray, at the head of Loch Fyne, the population of the area being approximately 15,000. Southend will be served by an extension of the Board's Campbeltown-Machrihanish network, at present supplied from a diesel-engined station at Campbeltown, which will be connected later with the hydro-electric generating station of the Glen Lussa project. Coastal villages and farms on both sides of the Kintyre peninsula between Campbeltown and Tarbert will be supplied by transmission lines which are part of the Board's Glen Lussa scheme. The new scheme for the upper part of Loch Fyneside will extend the distribution lines from Lochgilphead to Lochgair, Minard, Crarae, Furness, to link up with Inveraray which will receive supplies from an extension of a line from Dalmally erected to provide power for camps and equipment during the construction of the Glen Shira project.

Midlands.—COLLECTION OF ACCOUNTS.—By the casting vote of the Mayor, Newcastle-under-Lyme Town Council last week decided to support Stafford Council in a protest over the proposal of the Midlands Electricity Board to take over the collection of accounts as from 1st April next. The Town Clerk of Stafford in a letter stated that the Board was to be asked to receive a deputation urging the permanent use of the centralized collection facilities available in the Borough Treasurer's Office at Stafford.

North Scotland.—USE OF PEAT.—Meeting a deputation, Mr. T. Johnston (chairman) and Mr. McColl, of the North of Scotland Hydro-Electric Board, gave an assurance that the Board was devoting full consideration to ideas for the use of peat in power production and hoped to be in a position to report in the near future.

North Wales.—DEVELOPMENT SURVEY.—Mr. J. Eccles, chairman of Merseyside and North Wales Electricity Board, stated at Wrexham on 30th November, that a statistical survey had been carried out in each of the North Wales counties to find out the number of premises which had not yet been connected, and to make an overall appreciation of the cost. North Wales was more backward in electrical development than any other part of the country with the exception of the North of Scotland. The Board now had a detailed picture of the tasks which lay ahead. The work was being broken down into 200 schemes, which were being worked out in greater detail to determine which would give the maximum amount of service to the consumers for a given amount of materials. The Board planned to have schemes proceeding in each county simultaneously. Mr. Eccles described this as the largest scheme of planned electrical distribution which had ever been contemplated as a single project in Great Britain.

PROTEST AGAINST PROPOSED DAM.—More than 200 people, representing about 98 per cent of the villagers of Ro Wen, a Conway Valley (North Wales) beauty spot, have signed a petition protesting against a proposal to dam the river Afon Ro for the purpose of increasing the water-power resources of the Dolgarrog hydro-electric station. The proposed damming of the river at a point 1½ miles above the village is included in the B.E.A.'s hydro-electric scheme, estimated to cost £283,000.

Swansea.—DUAL CARRIAGEWAY LIGHTING.—After inspecting the experimental street lighting carried out by the General Electric Co., Ltd., at Hatfield, which consists of a single-line installation between dual carriageways, the borough engineer has recommended that a similar system should be adopted for the proposed new East Side Approach Road at Swansea.

Wimbledon. — OPPOSITION TO POWER STATION PROPOSAL.—In connection with the decision of the Council to offer the strongest possible opposition to the proposal of the British Electricity Authority to erect a power station on part of the Corporation's land, authority has now been given to retain counsel to represent the Corporation at the anticipated public inquiry following upon the objection to a Compulsory Purchase Order.

Electricity Output

STATISTICS issued by the Ministry of Fuel and Power show that the output from solid-fuel fired stations in the week ended 26th November was 928.2 million kwh, against 882.4 million in the preceding week and 893.4 million in the week ended 28th November, 1947. Stocks of coal at electricity undertakings at 27th November totalled 4,396,000 tons, a decrease of 79,000 tons compared with the previous week.

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1941

MARCONI'S Wireless Telegraph Co., Ltd.—"Targets for television transmitting tubes." 12133. 20th September, 1940. (613003.)

A. Hillier (Sperry Gyroscope Co., Inc.)—"Electro-hydraulic control systems." 15929. 10th December, 1941. (612804.)

1944

British Thomson-Houston Co., Ltd.—"Lighting circuits for electric-discharge lamps." 443. 12th January, 1943. (613007.)

General Electric Co., Ltd., and H. C. E. Jacoby. "Vacuum cleaners." 14472. 28th July, 1944. (613009.)

T. D. Bowes.—"Dynamo-electric systems for the transmission of mechanical power." 17812. 3rd December, 1943. (612811.)

W. W. Triggs (Bolidens Gruvaktiebolag).—"Apparatus for electrical measurement." 24215. 4th December, 1944. (612813.)

1945

Aircraft Marine Products, Inc.—"Electrical connectors." 3503. 14th December, 1943. (Cognate applications 3304/45 and 3505/45.) (613013.)

Elliott Co.—"Gas turbine plants." 10664. 28th April, 1944. (612816.)

L. G. Dawson.—"Gas turbines." 10914. 30th April, 1945. (612818.)

Marconi's Wireless Telegraph Co., Ltd.—"Pulse-echo position indicator systems, and other systems which involve the measurement of the time-interval between periodically occurring information-conveying pulses and periodically occurring datum pulses." 11187. 19th June, 1942. (613017.) Also 11449. 26th June, 1942. (Addition to 613017.) (613019.)

Igranic Electric Co., Ltd.—"Electric motor controllers." 21014. 17th August, 1944. (613024.)

P. G. Caldwell.—"Electric heaters and the manufacture thereof." 21821. 24th August, 1945. (Cognate application 27083/45.) (613025.)

Landis & Gyr Soc. Anon.—"Electric master and secondary clock system." 24240. 19th September, 1944. (612611.)

A. Schmitt.—"Electrical socket." 28160. 25th April, 1945. (613039.)

Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—"Frictionless suspensions for the movable elements of measuring apparatus, relays or analogous apparatus." 30488. 2nd March, 1944. (613044.)

Scophony, Ltd., and F. W. Abbott.—"Electric-discharge lamps." 30511. 14th November, 1945. (612718.)

Akt.-Ges. Brown, Boveri & Cie.—"Transformers." 30586. 15th December, 1944. (613045.)

Metropolitan-Vickers Electrical Co., Ltd., and R. W. Bailey.—"Combustion product power-plant." 33511. 11th February, 1946. (612721.)

British Thomson-Houston Co., Ltd.—"Motor control systems." 33654. 18th December, 1944. (613049.)

1946

M. P. Winther.—"Automatic electric control systems for material-winding or reeling apparatus." 2963. 4th May, 1944. (613052.)

Automatic Telephone & Electric Co., Ltd., and G. A. Burns.—"Electrical remote control and/or supervisory systems." 3216. 1st February, 1946. (612724.)

Waygood-Otis, Ltd.—"Open-phase protective apparatus for polyphase induction motors." 5054. 28th May, 1945. (612726.)

Marconi's Wireless Telegraph Co., Ltd.—"Current rectifying circuits." 5120. 19th February, 1945. (613053.)

Brush Development Co.—"Telephone systems of the inter-office, two-way loud speaking type." 5459. 16th November, 1942. (Divided out of 18854/43.) (612618.)

Akt.-Ges. Brown, Boveri & Cie.—"Transformers." 7542. 10th March, 1945. (613059.)

Landis & Gyr Soc. Anon.—"Apparatus for measuring the frequency of an alternating-current." 8688. 29th March, 1945. (612837.)

Waygood-Otis, Ltd.—"Switching systems for multiple electric circuits." 8870. 26th July, 1945. (613065.)

C. H. Parsons, Ltd., and G. B. Handley.—"Snap-action electric switches." 9022. 22nd March, 1947. (613066.)

Scophony, Ltd., and G. Wikkenhauser.—"Sound and picture transmission systems." 9690. 28th March, 1946. (612730.)

A. Lysholm.—"Moving blades for elastic-fluid turbines." 9841. 4th April, 1945. (612838.)

Maschinenfabrik Oerlikon.—"Mercury vapour rectifiers." 10636. 6th April, 1945. (612731.)

A. Abbey (D. Pinkas).—"Electric shaving devices." 10936. 9th April, 1946. (613070.)

G. Builder.—"Voltage regulators and compensators for use therewith." 11700. 17th April, 1945. (612733.)

W. T. Henley's Telegraph Works Co., Ltd., H. A. Tunstall, B. B. Evans and F. G. R. Jeson.—"Insulated electric conductor." 14868. 16th May, 1946. (612736.)

Hoover, Ltd.—"Washing-machines." 15189. 8th June, 1945. (612737.)

Allmanna Svenska Elektriska Aktiebolaget.—"Polarized transductor amplifier." 15773. 25th June, 1945. (613082.)

Dorman & Smith, Ltd., and J. Lund.—"Electric plug-and-socket connectors." 16149. 28th May, 1946. (612642.)

Metropolitan-Vickers Electrical Co., Ltd., and R. W. Bailey.—"Ship propulsion." 16187. 28th September, 1946. (612645.)

Metropolitan-Vickers Electrical Co., Ltd., W. K. Buchanan and W. Simpson.—"Silicone intermediates." 16188. 28th May, 1946. (612646.)

British Thomson-Houston Co., Ltd.—"High frequency dielectric heating apparatus." 16204. 29th May, 1945. (612647.)

Philips Lamps, Ltd.—"Supply conductors of electron-discharge tubes." 16233. 14th September, 1939. (612651.)

E. K. Cole, Ltd., and M. J. Toogood.—"Means and apparatus for dispensing mercury." 16265. 29th May, 1946. (612655.)

Automatic Telephone & Electric Co., Ltd., and P. N. Roseby.—"Electrical delay devices." 16281. 29th May, 1946. (612656.)

S. G. Brown, Ltd., and T. D. Ibbotson.—"Detachable electrical connections." 16320. 29th May, 1946. (612662.)

Marconi's Wireless Telegraph Co., Ltd.—"Television and like transmitters." 16393. 30th May, 1945. (612670.)

Wardle Engineering Co., Ltd., and D. H. Ogley.—"Suspension fittings for electric lights." 16411. 30th May, 1946. (612675.)

Pneulec, Ltd., and K. W. Cowlam.—"Moulding machines." 16433. 30th May, 1946. (612679.)

Allmanna Svenska Elektriska Aktiebolaget.—"Control system for electric motors and other electrical apparatus comprising push-button operated contactors." 16445. 29th June, 1945. (612682.)

Radio Corporation of America.—"Telegraphones." 16490. 30th May, 1945. (612689.)

British Thomson-Houston Co., Ltd.—"Gas eliminators for electric apparatus." 16493. 1st June, 1945. (612691.)

Union Minière du Haut Katanga.—"Process for the production of relatively volatile metals by reduction of their ores in an electric furnace." 16494. 17th May, 1945. (612692.)

General Electric Co., Ltd., and W. R. Rose.—"Electric rotary switches." 16533. 31st May, 1946. (612740.)

Philips Lamps, Ltd.—"Ultra-high-frequency cir-

cuits." 16535. 1st June, 1945. (612741.) "Electric rectifying installations." 16546. 9th March, 1942. (612852.) "Refractory bodies with a layer of lustrous carbon." 16549. 20th February, 1942. (612742.)

Naamlooze Venootschap Philips' Gloeilampenfabrieken.—"Blocking-layer electrode systems." 16552. 28th March, 1942. (612853.)

Babcock & Wilcox, Ltd.—"Water-tube steam boilers." 16590. 2nd June, 1945. (612746.)

Siemens Bros. & Co., Ltd., and F. Turner.—"Torsionmeters." 16603. 31st May, 1946. (612749.)

Standard Telephones & Cables, Ltd., C. L. Cooper and L. J. Ellison.—"Manufacture of dry rectifiers." 16619. 31st May, 1946. (612858.)

Standard Telephones & Cables, Ltd., and P. A. Childs.—"Contact springs of the type used in electromagnetic light current, contact making relays." 16620. 31st May, 1946. (612754.)

Aladdin Industries, Ltd., H. C. Hebard and B. S. Dearing.—"Electric radiators." 16627. 31st May, 1946. (612860.)

Telefonaktiebolaget, L. M. Ericsson.—"Lamp reflectors." 16641. 12th June, 1945. (612756.)

British Mechanical Productions, Ltd., and L. W. Shoney.—"Socket elements for electrical plug-and-socket connections." 16662/3. 31st May, 1946. (612861/2.)

Ferranti, Ltd., and L. Atkinson.—"Gas-filled or vapour-filled mercury cathode-discharge devices." 16716. 1st June, 1946. (612764.)

Contactor Switchgear, Ltd., and J. F. Liwski.—"Electromagnetic switches." 16720. 1st June, 1946. (612765.)

Standard Telephones & Cables, Ltd., and P. A. Childs.—"Electro-magnetic relays." 16766. 3rd June, 1946. (612774.)

A. H. Stevens (Wodack Electric Tool Corporation).—"Percussive tools." 16778. 3rd June, 1946. (612866.)

General Electric Co., Ltd., and C. G. Eden.—"Electric tumbler switches." 16805. 3rd June, 1946. (612777.)

A. E. Newton.—"Electric cut-out devices, particularly for electric immersion heaters." 16860. 4th June, 1946. (612782.)

Midland Electric Manufacturing Co., Ltd., and A. W. Vicary.—"Electric fuse holders." 16886. 4th June, 1946. (612783.)

Sunbury Inventions, Ltd., C. T. Dove, E. G. Doe and G. E. Tegerdine.—"Electrically operated lighter." 16930. 4th June, 1946. (612876.)

Philips Lamps, Ltd.—"Circuits for operating gaseous electric-discharge tubes." 16937. 18th March, 1942. (612786.) "Devices comprising an electric gas-discharge tube." 16939. 6th April, 1940. (612787.)

Ateliers de Constructions Electriques de Charleroi.—"Mercury vapour rectifiers having metallic tanks and liquid cathodes." 16949. 17th December, 1945. (612877.)

Soc. Anon. Compagnie Industrielle de Machines Automatiques de Comptabilité.—"Electro-magnetic relays." 16973. 4th May, 1944. (613089.)

Foster Transformers & Switchgear, Ltd., R. I. Bagnall and R. E. Jennings.—"Electric-arc welding systems." 17041. 5th June, 1946. (612886.)

T. Neill & Co. (Sheffield), Ltd., and W. L. Bower.—"Magnetic separators." 17050. 5th June, 1946. (612888.)

E. W. Bull.—"Magnetic deflecting means for cathode-ray tubes." 17143. 6th June, 1946. (612906.)

Westinghouse Electric International Co.—"Control systems for electric motors driving elevators." 17191. 9th June, 1945. (612916.)

British Thomson-Houston Co., Ltd.—"Magneto-electric machines." 17205. 9th June, 1945. (612918.)

Ever-Ready Co. (Great Britain), Ltd., N. Glaze and T. W. Lee.—"Portable battery lamps." 17223. 6th June, 1946. (612920.)

Siemens Bros. & Co., Ltd., and D. P. Long.—"Telephone systems." 17229. 6th June, 1946. (612921.)

Standard Telephones & Cables, Ltd.—"Call metering in telephone systems." 17263. 23rd June, 1945. (612925.)

Furzehill Laboratories, Ltd., S. Smith & Sons (England), Ltd., and O. P. T. Kantorowicz.—"Terminals for electric conductors." 17275. 6th June, 1946. (612928.)

Philips Lamps, Ltd.—"Electric phasemeters." 17291. 22nd September, 1945. (612929.)

C. G. Smith.—"Electric secondary batteries." 17319. 7th June, 1946. (Cognate application 24748/46.) (612931.)

Westinghouse Electric International Co.—"Speed-control systems for electric motors." 17423. 16th June, 1945. (612951.)

Heating Installations, Ltd., and I. D. Palmer.—"Glow-discharge starter switch for electric-discharge lamps." 17439. 11th June, 1946. (612952.)

Claude-General Neon Lights, Ltd., and W. R. Webb.—"Housings for high-voltage electric apparatus." 17457. 11th June, 1946. (612954.)

General Electric Co., Ltd., and A. E. McLeod.—"Lighting fittings." 17458. 11th June, 1946. (612955.)

British Thomson-Houston Co., Ltd.—"Starting arrangements for electric fluorescent lamps and other discharge devices." 17473. 7th June. 1945. (612958.)

Marconi's Wireless Telegraph Co., Ltd., and J. E. H. Welply.—"Very high-frequency radio communication systems." 17521. 11th June, 1946. (612967.)

W. W. Constantine (General Motors Corporation).—"Electric battery charging system." 17573. 12th June, 1946. (612972.)

Burgess Battery Co.—"Electric batteries." 17613. 20th June, 1945. (612975.)

W. P. Boase.—"Self-propelled electrically driven trucks." 17680. 13th June, 1946. (612985.)

British Thomson-Houston Co., Ltd.—"Electron-discharge devices and electrode assemblies therefor." 17695. 15th June, 1945. (613091.)

Copeland & Jenkins, Ltd., and S. D. Bolton.—"Arrangements for insulating electric resistance heating elements." 17705. 13th June, 1946. (612990.)

B. H. L. Williams.—"Electrical welding of aluminium and light alloys. 17706. 13th June, 1946. (612991.)

Philips Lamps, Ltd.—"Kinematograph projection apparatus." 22922. 2nd December, 1939. (613093.)

M. P. Winther.—"Voltage regulating systems." 28997. 4th May, 1944. (Divided out of 613052.) (613096.)

Siemens Bros. & Co., Ltd., and D. P. Long.—"Telephone systems." 29710. 4th October, 1946. (Addition to 583834.) (612896.)

1947

A. Hillier (Sperry Gyroscope Co., Inc.).—"Electro-hydraulic control systems." 13003. 10th December. 1941. (Divided out of 612804.) (612897.) "Vacuum tube amplifiers." 13004. 10th December, 1941. (Divided out of 612804.) (612898.)

1948

Texaco Development Corporation.—"Electric-discharge devices for use as radiation detectors." 5762. 2nd November, 1940. (Cognate application 5763/48.) (612899.)

N. E. Hewitt.—"Feeding devices for arc-lamp carbons." 7862. 4th July, 1945. (Divided out of 611049.) (613101.)

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers, which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

Northern Rhodesia.—A reader opening an engineering and contracting business offers his services as representative of British manufacturers. (X.203.)

Selected Radio Items

ALTHOUGH there has been no "Radiolympia" in London this year, many new radio and television receivers have recently become available, together with an abundance of components and accessories. Among these is a six-valve battery-operated receiver introduced by Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2, which gives an audio output comparing favourably with that of many mains receivers. It is housed in a handsome moulded cabinet and is arranged to operate from several types of battery: a 2-V accumulator, a 1.4-V dry battery or a combined l.t. and h.t. dry battery, the h.t. supply being anything between 90 and 120 V.

Philips battery model

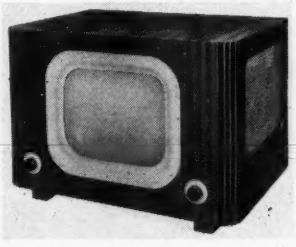
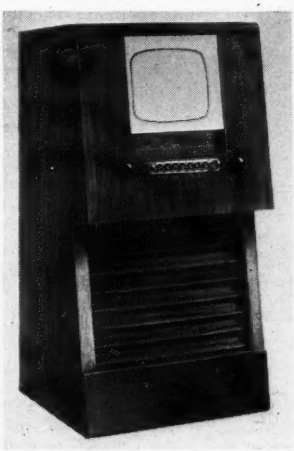


Table model televisor by Pye

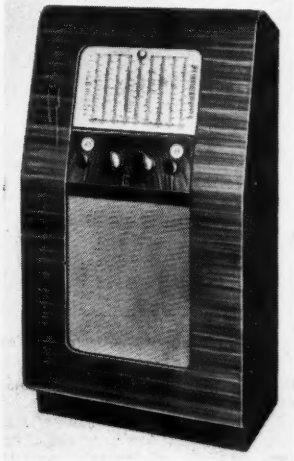
Another receiver of interest is "Model 600," manufactured by Ace Radio, Ltd., Tower Works, Pound Lane, London, N.W.10, which has been specially designed for the export market. Housed in a walnut console cabinet, it incorporates eight valves plus a cathode-ray tuning indicator and is arranged for band-spread tuning on the short waves.

The console version of the radio/television receiver manufactured by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, which first appeared at "Radiolympia" last year, is now on the market. The cabinet, which is of walnut, is 3ft high and has been designed so that the screen is at a comfortable height and inclination for armchair viewing; the upper panel containing the screen, tuning dial and controls and the lower one formed by the loudspeaker louvres are both inclined slightly upwards. The picture, which is 8in by 6.75in, has a brightness of 12/15 effective foot-candles enabling it to be used in daylight. The radio receiver incorporated in the set covers the usual long, medium and short wavebands. Terminals for a gramophone pick-up are also provided.

A transformerless table model televisor, made on the familiar lines of the a.c./d.c. broadcast receiver by Pye, Ltd., Radio Works, Cambridge, incorporating a 9in cathode ray tube, is designed primarily for use on 230/250-V mains, but auto-transformers are available for a.c. supplies of 190/220 V if required. Two controls are situated at the front of the receiver, one for sound-volume (including the on/off switch) and the other for picture contrast.



G.E.C. television/radio receiver built for armchair viewing



Ace console for export market

The wooden cabinet, which is finished in walnut veneer, measures only 17½in. wide by 12½in. high by 12¾in. deep, and the total weight of the receiver is 30 lb. The power rating of this televisor is approximately 125 W.

In an endeavour to meet the demand for a truly portable and compact mains-operated gramophone record player, the V.S.E. Construction Co., Ltd., has developed the "Karrigram." The instrument, which gives an audio output of approximately 2.5 W, employs miniature components and weighs only 16.75 lb. The pick-up is of the magnetic type and feeds a three-valve amplifier incorporating a tone control circuit designed to give a bass boost of 3.8 db per octave. A 6.5in flat type moving coil speaker is employed. A feature of the circuit arrangement is that it incorporates a capacitor as a wattless voltage dropper instead of the more usual resistance line-cord. The lightweight turntable unit is of Garrard manufacture and Mullard all-glass B8A miniature series valves are used throughout. The case measures approximately 14in. by 13.5in. and is finished in grey rexine lizard skin.

A single record player for 10in or 12in discs, operated by a press button which automatically places the pick-up on the record and starts and stops the turntable, has recently been developed by the Plessey Co., Ltd., Ilford, Essex. Two buttons are

Plessey automatic record player

incorporated, one for 10in. and the other for 12in. records. When either is depressed the pick-up arm is lifted over the playing groove of the record and the turntable is set into motion. Upon release of the pressure on the button, the pick-up is lowered on to the playing groove, the record is played through, and the turntable stops. The turntable is rim driven. The total weight of this unit is about 4½ lb, and it requires a clearance of only 2⅝in. below the top of the mounting board and 2 in. above.

A range of hermetically sealed lightweight transformers designed to operate consistently under abnormal conditions is introduced by Parmeko, Ltd., Percy Road,

V.S.E. "Karrigram"

Leicester. They will maintain their characteristics when subjected to such wide temperature variations as −40 deg C to the maximum working temperature of 100 deg C, with up to 100 per cent humidity, and will function satisfactorily at altitudes up to 50,000ft. The construction is capable of withstanding an acceleration of 10 G in any direction and all such vibrations as are set out in Admiralty Shock Test B.

These "Mercury" transformers are sealed in cylindrical copper containers, which are filled under vacuum with a special high-dielectric preparation. The connections are brought out through glass insulators and fixing bushes are provided both in the top and the base.

A comprehensive range of components can be accommodated within the seven container sizes already standardized including power transformers up to 170 VA, audio-frequency transformers from the miniature input variety up to 60-W audio output types and 20-H, 250-mA chokes.

Transmitters for Saudi Arabia

COMMUNICATIONS equipment worth over £15,000 has just been ordered by the Government of Saudi Arabia from Marconi's Wireless Telegraph Co., Ltd. The new equipment, consisting of short-wave transmitters suitable for operation on telegraphy or radio-telephony, will be used to link up the principal cities in Saudi Arabia. The transmitters, which are part of a new range of Marconi communication equipment, incorporate several of the newest features in radio communication technique, including automatic selection of pre-determined frequencies.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast.—7th January. Electricity Department. Stores, including electrical apparatus and material. (See this issue.)

Camberwell.—10th January. Borough Council. Electric lamps for one year from 1st April, 1949. W. Bell, borough engineer, Town Hall, S.E.5.

Darlington.—24th December. Corporation. Electrical installation at the Alderman Leach Primary School. (See this issue.)

Lanarkshire.—The County Council is shortly inviting tenders for sodium discharge lighting on the London-Carlisle-Glasgow-Inverness trunk road. Contractors wishing to be put on the list of contractors to whom specifications, etc., may be issued should communicate with the county lighting engineer. (3rd December.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. 6th January. Large lead-acid secondary batteries and battery replatal materials. (E.P.D. 43861/48. Ten/17.)*

17th January. Copper wire and tapes and cadmium copper wire and binders. (E.P.D. 43651/48. Ten/18.)*

26th January. 290,000 insulator spindles, without washers. (E.P.D. 43748/48. (Ten/12.)

Warwickshire.—Firms wishing to have their names placed upon the County Council's list of approved contractors for heating, hot and cold water supplies, steam services, electric lighting and power installations, etc., should apply to the county architect by 21st February next. (3rd December.)

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Blyth.—Town Council. Accepted. Electrical installations in 100 houses at Bebside (£3,185).—Blyth Co-operative Society, Ltd.

London.—L.C.C. Accepted. Electrical installations in schools: Eardley Road School, Streatham.—R. J. Kemp & Co. Colville School, Kensington.—Iverson Electrical.

Maidstone.—Corporation. Accepted. Electrical wiring, Shepway housing estate:—16 houses (£568).—Chas. Walter; 38 houses (£1,000).—F.J. Contract Services; 36 flats (£863), 28 flats (£671) and 40 flats (£959).—Reliance Electrical Co.

Rawtenstall.—Corporation. Accepted. Tender of combined local contractors per J. E. Lord (Waterfoot), Ltd., for electrical work in connection with the 62 houses on the Staghills and Carr Lane estates.

St. Marylebone.—Borough Council. Baths Committee. Recommended. 1,000-kW boiler and equipment, Seymour Place Baths.—Bastian & Allen, with wiring by the London Electricity Board.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnard Castle.—Houses (22) for the R.D.C.; R. C. Williamson (Durham), Ltd., builders, Evenwood, Co. Durham.

Barnet.—Extensions and alterations to Wellhouse Hospital; E. S. Moss, Ltd., builders, 159, Brent Street, N.W.4.

Bilston.—Laboratory, Manor Ironworks, for Joseph Sankey & Sons, Ltd.; Lavender, Twentyman & Percy, architects, 2, Waterloo Road, Wolverhampton.

Birmingham.—Works, Little Ann Street, for Banks & Davis, Ltd.; Skelcher & Partners, architects, Lloyds Bank Buildings, Solihull.

Blackpool.—Houses (44), Grange Park estate; Clifton Construction (Blackpool), Ltd., Clifton Road, Marton.

Boldon.—Electrical installations in 38 houses in Cleadon Lane and 44 at New Road; surveyor, Council Offices, East Boldon.

Bolton.—Pithead baths, Brackley Colliery, for Miners' Welfare Commission; G. C. Kemp, architect, 5, Old Queen Street, London, S.W.1.

Burnley.—Factory for Harling & Todd; Mullen & Dirkin, Ltd., builders, 146, Trafalgar Street.

Chorlton.—Laundry, Manchester Road and Albany Road, for White Star Laundry; Alfred Hodkinson, Ltd., builders, 62, Greenhill Street, Manchester, 15.

Clayton.—Additions to factory, Ashton New Road, for British Recovered Rubber Co., Ltd.; Cruickshank & Seward, architects, 16, Princess Street.

Collyhurst.—Four-storey extensions to works for Watts & Corry, Ltd.; H. Elder, 66, Manchester Road, Wilmslow, Ches.

Coventry.—Secondary schools at Caludon Castle and Broad Lane, and primary schools at Brookside Avenue, Parkgate Road and Wyken Croft (£885,400); D. E. E. Gibson, city architect, 1a, Warwick Row.

Cross Heath.—Egg packing factory, London-Manchester Road, for Staffs Egg Producers, Ltd.; Wood, Goldstraw & Yorath, architects, Victoria Chambers, Station Road, Tunstall, Stoke-on-Trent.

Croydon.—Extensions to factory; E. C. de Witt & Co., Ltd., Cherry Orchard Road.

Darlington.—Houses (148), Longfield Road, area, for the Rise Carr Welfare Housing Society; Mr. Craggs, secretary of the Society, c/o Darlington & Simpson Rolling Mills, Darlington.

Denton.—Houses (60), Lees House Farm and Haughton Hall estates; U.D.C. surveyor, Town Hall, Denton, near Manchester.

Dorchester.—Houses (24), Middle Farm site, for T.C.; L. M. Austin, architect, Bowling Alley Walk.

Durham.—County training college, county architect, Court Lane, Durham.

Enfield.—Factory, Ponders End; E. H. Firmin, architect, 111, Park Street, W.1.

Houses (36), Roedean Avenue, for U.D.C.; Allen Fairhead & Sons, Ltd., builders, Sydney Road.

Essex.—Secondary school, Chase Cross, Romford (£149,550); county architect, Chelmsford.

Exeter.—Houses (100) and block of eight shops and flats, Countess Wear estate; city architect.

Finchley.—Blocks of flats (102 dwellings), Elmshurst estate, East End Road; Town Planning Department, The Avenue, Regents Park Road, Finchley, N.3.

Grimsby.—Factory, Pyewipe estate; Entwistle & Bacon, Ltd., 163a, Lord Street, Southport.

Haltwhistle.—Houses (44), Bardon Mill; R.D.C. surveyor.

Halesowen.—Pumping station, etc., for Upper Stour Main Drainage Board; J. Harper & Sons (Blackheath), Ltd., Blackheath, Birmingham.

Heywood.—Semi-detached houses (26), off Broadfield Street; A. Openshaw & Sons, builders, 1, Duke Street.

Ilford.—Houses (44), Barley Lane (£58,397); Nash Properties, Ltd., Romford.

Kirkby.—Factory, East Lancashire Road; Imperial Chemical Industries, Ltd., Chemical Division, Cunard Buildings, Liverpool, 3.

Lancashire.—Grammar school, Upholland, for Lancashire E.C.; F. R. S. Yorke, architect, 35, Welbeck Street, London, W.1.

Junior and infants' school, Lambshear Lane, Lydiate, near Liverpool, for Lancashire Education Committee; H. Thearle, architect, 66, Rodney Street, Liverpool, 1.

Liverpool.—Dwellings (140), Bond Street area; city architect.

London.—HOLBORN.—Rebuilding Gray's Inn Hall; E. Maufe, architect, 139, Old Church Street, S.W.3.

KENSINGTON.—Block of offices, Kensington Crescent, for Prince of Wales Theatre Property Co.; Sir Robert McAlpine & Sons, builders, 80, Park Lane, W.1.

BALHAM.—Eight blocks of flats, Balham Hill; Caroe & Partners, architects, 3, Gt. College Street, S.W.1.

WOOLWICH.—Out-patients' dept., Woolwich and District War Memorial Hospital; Pite, Son, & Fairweather, architects, 6, Queen Anne's Gate, S.W.1.

Manchester.—Factory, John Street, Strangeways, for David Leon & Co., Ltd.; Pendleton & Dickinson, architects, 16, Brazennose Street.

Transport depot, site of White City, Old Trafford (£150,000); city architect.

Markinch.—Houses (50); burgh engineer.

Middlesex.—Primary school, Butts Farm (£108,000); county architect, Middlesex House, S.W.1.

Montgomery.—Primary school, Abermule; T. G. Davies, director of education, County Offices, Newtown.

Newcastle (Staffs).—Maisonettes (24), Meadow Lane, Cross Heath; Wm. Brammer & Co., Ltd., builders, Longfield Road, Hartshill.

Houses (28), Talke Road, for F. E. Smith; A. Cotton & Sons, architects, Piccadilly, Tunstall, Stoke-on-Trent.

Northenden.—Factory, Longley Lane, for Star Process Engraving Co., Ltd.; Contractors, Ltd., 4, Clarence Street, Manchester, 2.

Northumberland.—1949 school building programme: Five schools in the Longbenton area; two at Blyth; and one each at Bebside, Wooler, Monkseaton, Shiremoor, Wallsend, Hexham, Ponteland, Newburn and Haltwhistle. County architect, County Hall, Newcastle-on-Tyne.

Otley.—Schools for R.C. authorities; Rev. T. Donovan, P.P., Church of Our Lady and All Saints, Bridge Street.

Oxford.—Infants' school, Barton; E. G. Chandler, architect, Town Hall.

Perth.—Police station (£10,000); chief constable.

Houses (20), Letham estate, for Town Council; burgh surveyor, 16, Tay Street, Perth.

Rotherham.—Houses (38), Keppels estate; J. V. Dowling, builder, 27, St. Anne's Road.

Rugby.—Extensions, Railway Wagon Works, for Thomas Hunter, Ltd.; G. Wimpey & Co., Ltd., builders, Tilehouse Lane, Denham, Uxbridge.

St. Paul's Cray.—Further 1,000 dwellings for L.C.C.; Holland & Hannen & Cubitts, Ltd., builders, 1, Queen Anne's Gate, S.W.1.

South Shields.—Houses (84), branch library in Sunderland Road, and two hostels for old people; borough engineer.

Staffordshire.—Residential nursery school and nursery training school, Rowley Park (£43,000); A. C. H. Stillman, education architect, County Education Offices, Stafford.

Stockton-on-Tees.—Dairy and ice-cream factory (£125,000), Church Road, for the Stockton Co-operative Society, Ltd., Wellington Street, Stockton.

Sunderland.—Five new schools for the E.C. during 1949 (£500,000); education architect, Ryhope Road, Sunderland.

Two community centres (£10,000); borough engineer, 27, Fawcett Street, Sunderland.

Sutton Coldfield.—Permanent houses (62), Falcon Lodge estate; borough surveyor, The Council House.

Swansea.—Houses (116), Gendros estate, for T.C.; Geo. Wimpey & Co., Ltd., Newport Road, Cardiff.

Thornaby-on-Tees.—Factory addition, Mandale Road, for W. M. Pumphrey, Ltd.; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Tynemouth.—Houses (32), Lynn Road, for the T.C.; Urban Development Co., Ltd., builders, Gateshead.

Vaynor and Penderyn.—Houses (48), Trefechan, near Merthyr; A. J. Hayes & G. H. Griffiths, architects to R.D.C., 98-100, Queen Street, Cardiff.

Wakefield.—Bakery; Wakefield Industrial Society, Ltd., Smith Street.

Wallasey.—Infants' and junior schools, Mills Lane, Poulton; R. F. B. Grundy, borough engineer, Town Hall.

Wealdstone.—Houses (56) for Harrow U.D.C.; C. & W. Montague, Ltd., builders, Glebe Road, Stanmore.

West Riding.—Primary schools, Birkenshaw Bottom (£42,233) and Great Gomersal (£34,260), and secondary school, Bolton-by-Bowland; H. Bennett, county architect, County Hall, Wakefield.

Wirksworth.—Central omnibus station, Canterbury Road; Trent Motor Traction Co., Ltd., Uttoxeter New Road, Derby.

Wythenshawe.—Catholic primary school, Newell Green; Right Rev. H. V. Marshall, Wardley Hall, Worsley.